UNITED NATIONS DEVELOPMENT PROGRAMME
GLOBAL ENVIRONMENT FACILITY
PROJECT DOCUMENT

Number:	**EGY/97/G31/B/1G/99 and UNDP # EGY/97/003**
Title:	Energy Efficiency Improvements and Greenhouse Gas Reduction
Country Eligibility:	UNFCCC ratified 5 December 1994
Project Site:	Cairo, Egypt, headquarters for national activities
GEF Focal Area:	Climate Change
Implementing Agency:	Ministry of Electricity and Energy
Executing Agency:	Egyptian Electricity Authority (EEA)
Duration:	4 years and 6 months
Estimated starting date:	May 1998

UNDP and cost sharing Financing:
GEF input.....$4,110,000
Govt. of Egypt.....$986,000
UNDP input..... $800,000
Total:.....$5,895,000
(less in kind LE 600,000)

Brief Description: The overall objective of this project is to assist Egypt in reducing the long term growth of GHG emissions from electric power generation and from consumption of non-renewable fuel resources. In responding to the new operating conditions, public and private industry must invest in process modifications and new machinery to remain competitive, with excellent likelihood that their investments will have favourable rates of return based on savings from reduced operating costs. The funding for this project will leverage the new investments in ways that are most beneficial to the global environment.

The long-term policy and overall objectives will be achieved through:

- supporting efficiency improvement and loss reduction in the generation, transmission and distribution of electric power;
- facilitating adoption and implementation of energy conservation measures in residential, commercial, and industrial sectors through education and promotion, financing, and standard-setting activities;
- stimulating and guiding the private sector in the development of a capability of end use energy efficiency service planning, feasibility analysis, conceptual design, and project implementation, including the manufacture of energy efficient products;
- assisting in the international and regional transfer of experience and technology that could be instrumental in GHG emission reduction;
- promoting public and private sector investments in energy projects that are beneficial for the global environment.

On behalf of:	Signature	Date	Name/Title (Please type)
The Government:	_____	_____	_____
UNDP:	_____	_____	_____

EGYPT-ENERGY EFFICIENCY IMPROVEMENTS AND GREENHOUSE GAS REDUCTIONS
TABLE OF CONTENTS

ACRONYMS

BOT	Build Operate Transfer
BRC	Building Research Center
CFL	Compact Fluorescent Lamp
DRTPC	Development, Research, Training and Planning Center
DSM	Demand-Side Management
ECEP	Energy Conservation and Efficiency Project
EDC	Electricity Distribution Company
EEA	Egyptian Electricity Authority
EEAA	Egyptian Environmental Affairs Agency
EEBM	Energy Efficient Building Manager
EEBRA	Energy Efficient Building Research Analyst
EEEM	Energy Efficiency Equipment Manager
EEES	Energy Efficiency Equipment Specialist
EFI	Egyptian Federation of Industries
EGPC	Egyptian General Petroleum Company
EMF	Electro-Magnetic Field
EOS	Egyptian Organization for Standards
EREDO	Egyptian Renewable Energy Development Organization
ESBI	Electricity Supply Board of Ireland
ESCO	Energy Service Company
ESMAP	Energy Sector Management Assistance Program
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gases
GOE	Government of Egypt
HLCC	High Level Coordination Committee
IPF	Indicative Planning Figure Development
IPH	Industrial Process Heat
IRG	International Resources Group
IRP	Integrated Resource Planning
LRMC	Long Run Marginal Cost
MENA	
MOEE	Ministry of Electricity and Energy
MOI	Ministry of Industry
MOPNR	Ministry of Petroleum and Natural Resources
NREA	New and Renewable Energy Authority
OECP	Organization for Energy Conservation and Planning
OME	Observatoir Mediterraneen de l'Energie
OSPM	OECP Senior Project Manager
PAC	Project Advisory Council
PPA	Power Purchase Agreement
PPER	Project Performance Evaluation Report
PTD	Project Technical Director
SNAP	Support for National Action Plan
TIMS	Tabbin Institute for Metallurgical Studies
TOE	Tons of Oil Equivalent
TOR	Terms of Reference
TOU	Time of Use
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UPS	Unified Power System
USAID	United States Agency for International

Section A: CONTEXT

Egypt with its population of approximately 60 million people, represents almost 25% of the total Arab population, and is the most populous of the Arab states. It lies in the geopolitical center of the Middle East, steering a middle ground among strident neighbors and one-time adversaries. Although once a rural, agricultural country, it is rapidly urbanizing. Approximately 25% of its population lives in Cairo alone, and another 20% in other urban centers and new cities rising in the desert. Population growth has stripped the fertile farmlands of the Nile River valley and delta, and supplementary food must be imported.

The economy is now steadily recovering from a period of stress as well as dwindling sources of foreign exchange. The tourism industry, which experienced several upheavals in recent years, aggravated by concerns for personal safety, is again expanding. Unsettled conditions in the Gulf region that impacted salaries earned abroad by Egyptian workers have been somewhat ameliorated. The cotton industry continues to face increased competition in world markets for high quality cotton goods. There is an active public works program designed to ease the traffic and congestion problems for which Egypt is well-known, and to give access to remote areas.

Egypt is at a crossroads in its transition from a centrally planned, inward-looking economy to a free-market, outward-looking economy. The country has been pursuing a reform program driven by deregulation, restructuring, and privatization since 1991. Macroeconomic stability has been achieved. As a percentage of GDP, the overall fiscal deficit was reduced from about 17% to 2.5% in the period 1991-94, and foreign currency reserves have increased to US$18 billion, an equivalent of 12 months of imports of goods and services.[1]

The key to long-term stability and enhanced growth is to follow the directions indicated by the stable macroeconomic framework and move toward reforms at the sectoral level. Public sector restructuring, including public divestiture and other reforms, should continue to enable rapid and sustainable growth led by the private sector. The challenge for the government lies in adopting and implementing policies and institutional changes that will capitalize on the efficiency gains of the reform programs. The energy sector is thus on a challenging path in an economy undergoing protracted reform.[2]

[1]ESMAP, *Arab Republic of Egypt: Energy Sector Assessment,* World Bank Report No. 189/96.

[2]Ibid.

SECTION A

1. Description of Subsector

The subsector being addressed in this project is the Energy Sector of Egypt. The subsector includes: abundant fossil resources in the form of petroleum and natural gas; a power generation system incorporating hydroelectric, thermal, and internal combustion engine systems all integrated within a steadily expanding Unified Power System (UPS) for transmission and distribution; and the foundations for major developments in new and renewable energy sources and energy conservation.

There has been steady growth in the development of petroleum resources, as well as in associated foreign income. Egypt is a net exporter of oil and oil products. There has also been steady growth in development of natural gas resources, which have now reached a production level of 1480 mmcf/day (equivalent to 13.8 MTOE per year). Development of natural gas for domestic consumption, especially in electricity generation, household use, and some industrial processes, has enabled the export of an increasing fraction of crude oil production. Current oil production now stands at 880,600 bbl/day (equivalent to 42.3 million metric tons per year), while the existing combined refinery capacity is 29.5 million metric tons per year. Presumably, the remaining 12.8 million metric tons of crude are exported. In addition, approximately 70% of refined products are exported, as well. However, because the refineries have limited capacity to upgrade residual oil to higher value products, Egypt does import petroleum products such as jet fuel and diesel fuel at a sacrifice of valuable foreign exchange earnings. The refineries intend to introduce optimization programs to reduce existing mismatches between refinery output and the domestic petroleum product demand profile.[3]

The abundant energy resources that were made available to consumers at subsidized prices for so many years have contributed to inefficient usage in Egypt. The consumption of electricity is also inefficient for the same reason (although the generation of electricity is now quite efficient). Government subsidies to the energy sector have created a negative incentive for customers to control consumption or conserve energy. Industry continues to use inefficient processes. Per capita consumption of energy in Egypt is nearly 0.6 TOE/year, and of electricity alone, nearly 800 kWh annually.

Within the Ministry of Petroleum, the Organization for Energy Conservation and Planning (OECP) conducts energy planning and analysis, undertakes studies and promotes awareness of fuel energy consumption in various sectors of national economy. Over the last ten years, the OECP has conducted numerous studies and fuel energy audits primarily focused on the fuel energy consuming industry, while only touching peripherally on electric power consumption. OECP's mandate does not, however, focus

[3]ESMAP, *Arab Republic of Egypt: Energy Sector Assessment,* World Bank Report No. 189/96.

on efficiency of electric power consumption nor efficiency of the electricity sector and has no direct link to the Ministry of Electricity and Energy (MOEE) or the Egyptian Electricity Authority (EEA).

In the past, the primary focus of MOEE and EEA, with substantial support from international donor agencies, has been to provide a reliable source of electricity for Egypt while operating within the Governmental laws and regulations. Objectives such as profitability and adequate return on investment have not been priorities. Moreover, EEA has had no authority over the cost or source of fuel used, nor over the price of electricity sold.

Installed capacity in the UPS is 13,000 MW, of which only 10,700 MW is normally available because of periods of reduced hydro discharge and aging thermal stations with limited performance. Maximum load in the 1995/96 operating year was 8,500 MW, indicating a reserve capacity of approximately 25%. The percentages of delivered power were: hydro 21%, combined cycle 24%, and steam 54%. Efficiency in utilization of fuel resources has now reached 38.9%. Consumption of mazout (heavy oil) accounted for 27% of energy production; natural gas accounted for 73%.[4]

2. Host Country Strategy

The Government's objectives in the energy sector are embodied in the National Five-Year Plan for the period 1992-97 which reflects a turning point in the development process through a systematic move to a market-oriented economy. The Plan aims to adjust the public sector toward greater autonomy and to increase private sector participation in energy operations. Within this broad framework, the government's main energy sector objectives are to:

Meet domestic energy needs in a cost-effective manner.
Overcome major impediments to improving overall sector efficiency.
Maximize exportable surpluses to earn valuable foreign exchange.
Increase the role for the private sector in energy sector operations.

The power sector has achieved gradual improvements in technical performance during the past 10 to 15 years: thermal efficiency has improved from less than 30% to the current value of 38.9%; system losses have been reduced from 18% to 14%; transmission losses are now below 7%; the network has adequate reserve capacity and the number of

[4] *Annual Report of Electric Statistics 1995/1996*, Arab Republic of Egypt, Ministry of Electricity and Energy, Egyptian Electricity Authority.

unscheduled outages has been dramatically reduced; almost 25% of total energy production is from seven combined cycle power stations burning natural gas. However, operational efficiency is below potential because of transmission network constraints and dispatching limitations.[5]

Although concerns regarding energy conservation and environmental protection are contained only implicitly in the Five-Year Plan objectives to improve efficiency, maximize fuel exports, and encourage private sector operation, Egypt has become increasingly interested in energy conservation initiatives. Faced with increasing costs as energy prices are adjusted toward true market value, a growing number of public and private companies that make intensive use of energy resources are actively involved in conservation programs and have initiated and financed several programs through internal funds as well as grants. Environmental protection is an increasing concern of the Government, as well, but still in the early development stage. A US$50 million USAID program has had a dominating influence in defining the issues and opportunities regarding the environment. The National Environmental Law, which was passed in December 1993, established air quality standards and has led to development of specific environmental protection programs in individual sectors (power, petroleum, transportation, and industry). Yet, despite this commitment, the real and sustainable benefits to be realized by energy conservation have remained elusive.

In the area of new and renewable sources of energy, it is widely acknowledged that there is a large potential in Egypt. Several renewable energy projects are under way with support from the US and several EU nations. Many alternative energy technologies are being explored, with development of large wind farms and solar thermal power generation having the highest priority. Work to date has focussed on identification of technology, however, with actual incorporation of new and renewable energy sources into long range energy planning still a future goal.

3. Prior and Ongoing Assistance

Egypt has had the benefit of substantial international donor community assistance to its energy sector, and especially the power sector, over the past several decades. This assistance prepared an essential foundation upon which the Global Environmental Facility (GEF) Project is designed. There is a permanent Donor Committee on Energy and Environment for Egypt that provides a forum in which all donor activity can be identified and discussed to prevent duplication or conflicts in objectives or strategies. For example, it was through this Committee that the United States Agency for International Development (USAID)/Cairo mission learned of the United Nations Development

[5]ESMAP, *Arab Republic of Egypt: Energy Sector Assessment,* World Bank Report No. 189/96.

Programme (UNDP)/GEF project and sought out meetings to ensure cooperation between their two sets of projects.

The following projects are prior and ongoing assistance activities within the Government of Egypt (GOE) and the power sector:

Climate Change Action Plan — OECP

Through United Nations funding, the Egyptian Environmental Affairs Agency (EEAA) performed some of the initial inventory work and identification of policy options for greenhouse gas (GHG) reduction in Egypt. One of the areas that EEAA could not address in detail pertained to cogeneration as a means to improve overall energy efficiency and reduce emissions. The current UNDP/GEF project will address cogeneration in Component 3.

The United Nations Environment Program (UNEP), with Finnish funding, supported a study by the EEAA of possible GHG reduction scenarios in the electricity sector. The reductions proposed in the UNDP/GEF energy efficiency project are consistent with the possible reduction scenarios identified by EEAA, and are designed to fill part of the strategy and support gap through practical implementation schemes that promise to achieve the potential reductions sooner than would otherwise occur.

On another project under GEF capability-building objectives, the UNDP/GEF is providing assistance to the GOE through OECP and EEAA to develop the capacity to respond to the country's communications obligations under the UN Framework Convention on Climate Change (UNFCCC). This project began in 1996, will last until 1998, and will emphasize training and delivery of communications targeted both at professionals and the public on the broad issues of: climate change; expanding knowledge and data on non-energy sector inventories of GHG sources and sinks; and assessing policy opportunities and priority areas for intervention for non-energy sectors. This will complement the work well-underway to reduce carbon emissions in the energy sector.

The GOE is also receiving USAID funding through the Country Studies Program assistance (begun in 1994) to perform the Support for National Action Plan (SNAP) program, which will help with Egypt's preparation of a National Climate Change Action Plan, prepare in-depth evaluations of mitigation and adaptation measures, and identify the additional resources (information, institutional capacity, research, technical and financial assistance, and community and non-governmental participation) that Egypt requires to implement the plan. The SNAP project began in 1995 and involves OECP and EEAA, along with many other organizations including EEA, the New and Renewable Energy Authority (NREA), the Egyptian General Petroleum Company (EGPC), and other

research, university, and technical organizations. The Action Plan should be completed by the end of 1997.

Energy Policy and Planning

USAID

Over the years, USAID has supported NREA within MOEE, OECP within the Ministry of Petroleum and Natural Resources (MOPNR), the Energy Conservation and Efficiency Project (ECEP) under the auspices of the Ministry of Industry which is being carried out by agencies outside the GOE, and most recently, EEA, in a program of institutional development.

Between 1979-93, USAID's involvement emphasized assistance towards the construction of new power facilities. However, after that period USAID has shifted its focus towards power sector policy and in 1994 negotiated a policy matrix with the GOE and MOEE that includes the areas of (i) financial viability; (ii) regulatory reform; (iii) autonomy of enterprises; and (iv) improved planning and efficiency. This has translated into two major technical assistance projects.

The first is the "Consultant and Construction Management Services for Power System Projects in Egypt," a $200 million technical assistance project to upgrade EEA's internal capabilities. Components of this assistance that are provided by Gilbert/Commonwealth Associates with Pennsylvania Power & Light include reactive power compensation, operation management and protection, computer software upgrades, and time-of-day metering assistance. Phase II of this project is expected to address both integrated resource planning (IRP) and demand-side management (DSM) support, including the tools, training, and other resources that EEA needs to execute improved planning activities. This USAID project will create a planning framework into which the experience and data results of the UNDP/GEF project can be inserted. The GEF project data on the costs and benefits of energy efficiency can then be directly integrated into EEA's load forecast and power sector investment planning.

The second major USAID project for EEA is the "Institutional Development Project", with assistance from the contract consultant International Resources Group (IRG). This project provides as-needed assistance to EEA's middle managers and technical staff in the areas of finance, customer service, billing, organization development, and project management through a combination of formal training programs and on-the-job guided learning. This USAID project created much of the awareness within EEA of the need to develop a customer service function, incorporating future energy efficiency services. The UNDP/GEF project will provide the focused assistance to develop the technical content for energy efficiency that can be delivered through EEA's customer service organization.

The present GEF project also complements these USAID efforts as it is both supports additional EEA activities that are specifically targeted to reduce greenhouse gas emissions, and offers technical assistance to other agencies better-positioned than EEA to achieve certain end-use efficiency improvements such as for new buildings and equipment.

European Community

A plan for greater efficiency in generation investment and operation was developed through assistance to EEA from the Electricity Supply Board of Ireland in the late 1980s and early 1990s. This project conducted research into the possibilities for load management with large industrial electricity customers. The Canal Electricity Distribution Company (EDC) cooperated in this study, by looking at how the cement industry could modify its daily demand to shift load out of the peak period. Recommendations included development of a Time-of-Use (TOU) electric tariff to encourage large industrial and commercial facilities to shift the timing of some electrical use out of the peak period, and promotion of higher efficiency residential lighting to reduce evening peak electrical demand. The current GEF project aims to reduce remaining institutional and implementation barriers to both of these recommendations.

Transmission and Distribution Efficiency — EEA

In parallel with and complementary to the present GEF project, UNDP is supporting the following two projects in this sector:

> (I) "Operational Unit for Electricity Programme Approach," implemented by MOEE, which addresses harmonics, software inventory for EDCs and the Rural Electric Authority, and rural energy planning, and
> (ii) "Geographic Information System for the Egyptian Electricity Authority," implemented by EEA, which develops power system data that permits improved local transmission and distribution system planning, as well as expedited identification of the location of system problems.

The total budget of these two projects is $1.3 million. These ongoing programs insure that developments in the Egyptian electricity sector are fully coordinated with respect to potential regional developments toward an expanding international network for electricity transmission, and that the geographic database is an accurate and well-maintained resource available to support all transmission and distribution planning and development efforts.

These project goals are in line with the electricity program approach at the ministry level that views developments in the Egyptian electricity sector in a larger regional context

with respect to future expanding interconnections and exchange of energy across national boundaries. In addition, several specific technical areas mentioned above within the UPS system are also being supported in coordinated fashion with additional funding from Finnish and Swedish sources, particularly with respect to means for mitigating the effects within the interconnected network of low voltage harmonics through use of synchronized var compensation and static filter methods.

Distribution System Efficiency — EDCs

As part of its assistance to MOEE and EEA, USAID had initiated an electric distribution system efficiency improvement project with the Alexandria Electric Distribution Company (AEDC). This occurred prior to the reorganization of the distribution function and its transfer to the Ministry of Public (Business) Sector. This holdover support has enabled the AEDC to make substantial improvements to its distribution system.

Based on this success, USAID is beginning design of a new project for institutional strengthening of EDCs, to be launched late in 1997 or in 1998.This will target three of the other seven EDCs [tentatively: West Delta (Behera), Cairo, and South Upper Egypt (Aswan)], and has an estimated value of $40 million. Key objectives are to improve performance with collections, billing systems, planning and distribution efficiency improvements. By the end of this project, three of the eight EDCs will have received substantial technical and financial assistance in improving the efficiency and quality of local power distribution systems. In addition, substantial progress will have been made toward privatization of electricity distribution, with the possibility of actually privatizing at least one distribution company by the end of the project. The new program will incorporate components in human resources development including a substantial training program, management practice, and cooperation with the new tariff regulatory board that will be applicable to all EDCs. The UNDP/GEF project will help develop an expanded set of energy services (such as energy audits, engineering design and construction of facility efficiency improvements, and energy efficient equipment leasing) that EDCs as well as energy service companies (ESCOs) can offer to energy end users.

End-Use Energy Efficiency

OECP

Supported in part by USAID assistance in the early 1980s, OECP developed the capability to perform technical energy audits for petroleum and other large industrial facilities. These audits produced the first estimates of the economic potential for energy efficiency. OECP has continued to offer audit services with GOE funding to industries since that time, but in more recent years has shifted its emphasis to more strategic energy efficiency activities, rather than case-by-case facility improvements.

Ministry of Industry — USAID/ECEP

From the late 1980s through mid-1998 USAID has funded an approximately $30 million program for energy conservation and the environment targeted at total energy efficiency in the industrial sector. Its objectives are to demonstrate energy efficient technologies for industry, promote their adoption in Egypt, offer training and technical assistance on energy management for industry and commercial buildings, demonstrate the benefits of demand side management, and perform a variety of studies regarding market acceptance (information, local vendors, financing mechanisms, etc.) of these technologies and energy management measures. This program was undertaken by Cairo University's Development, Research, Training and Planning Center (DRTPC), the Tabbin Institute for Metallurgical Studies (TIMS), and the Egyptian Federation of Industries (EFI), under the management of two U.S. consulting organizations (Overseas Bechtel, Inc. and Hagler Bailly Consulting, Inc.).

One of the components of the USAID/ECEP program has been a DSM pilot project in Alexandria and Cairo. Although the program was implemented through the distribution companies, EEA was a secondary participant. The program involved the training of energy audit teams, the systematic review of all major factories within each EDC territory, management of municipal lighting, and energy audit in residences. In the pilot program, ten factories were selected for more detailed evaluation of their total energy requirements, both fuel and electricity.

Recent studies performed under the ECEP project produced the following findings of relevance to the GEF energy efficiency project:

Recommendations from the Institutional Capability Assessment for DSM Implementation:
(Including energy efficiency and load management; this assessment and its recommendations were developed in 1996 fully independently of the GEF project design.)[6]

Policy

1. OECP and EEA jointly should prepare a policy statement in support of energy efficiency at generation, transmission, distribution, and end-use levels, based on economic and environmental principles.

Power Sector

[6]For further details see Hagler Bailly Services, Ind., *DSM Implementation: Institutional Capability Assessment*, Final Report, January 1997, prepared for USAID Energy Conservation and Environment Project. See especially Table 5. Activities, Organizations, and Resource Needed to Pursue Alternative Strategies (free market; codes & standards; and services and incentives with the power sector, private ESCOs, and national resource planning)

2. EEA should develop a simplified economic analysis of DSM.
3. EEA should develop an experimental TOU tariff.
4. EEA and the EDCs jointly and separately should carry out modest pilot DSM programs to gain implementation experience, build capabilities, and develop data for further analysis.

Codes and Standards
5. OECP, with the Egyptian Organization for Standards (EOS) and technical support, should develop plans for voluntary equipment standards, based on a quality mark or green seal approach.
6. OECP should assess the economic break-even requirement for local manufacture of energy efficient equipment.

Private Sector
7. USAID/ECEP or a successor USAID program should incubate the development of energy service delivery organization capabilities and help create a market demand for an eventual private ESCO industry.

The UNDP/GEF project design proposes to conduct activities that would either remove barriers to or initiate development work for the eventual implementation of recommendations 3 -7. As is discussed below, the GEF project will focus on developing government and power sector initiatives, and "paving the way" for full-scale implementation. In complement, the anticipated new USAID project will support delivery and implementation activities within the private sector that will largely take place in the framework and supportive environment established by the GEF project.

From the *Cogeneration Feasibility Study in Tenth of Ramadan City:* Cogeneration in a "bundled" concept was explored in a study that addressed the growing power demand from industrial expansion at Tenth of Ramadan City. In the selected approach, several adjacent industries aggregated their electricity and thermal energy requirements that could be supported by a single, larger (independent) private power project. The findings reported that this approach

> "appears to be technically feasible and financially sound based on payback potential, although major questions remain with respect to acceptability and practicality of implementation".

Cogeneration projects within individual industrial facilities are less complex and appear to be more practical to implement than the aggregated type investigated for the Tenth of Ramadan City. The proposed GEF project will effectively reduce the barriers to both types of cogeneration project development.

From the *Feasibility Assessment of the ESCO Approach in Egypt:* Key recommendations were for the GOE to work with the private sector to

1. Assist financial institutions to develop medium-to long-term financing of energy efficiency
2. Help organizations like DRTPC and TIMS transition from government-supported technical institutes to commercial energy service organizations
3. Provide technical assistance with energy savings monitoring and verification protocols
4. Provide assistance to potential ESCOs
5. Promote the benefits of ESCO services to the business community
6. Address the need for policy reform within the GOE for tax incentives, custom regulations, and energy codes and standards that can help achieve energy efficiency.

The UNDP/GEF project will focus on removing barriers to the potential demand for ESCO-type services among commercial and industrial end users, and will provide an information center where both prospective ESCO businesses, lenders, and their clients can obtain information about typical energy efficiency improvements and the way ESCO services work. Technical assistance services with measurement and verification protocols also will be offered, while the project will also seek to remove barriers to energy efficiency from unnecessarily high customs duties.

European Community

The European Community Observatoire Mediterraneen de l'Energie (OME) project was created in 1993 with the Athens declaration that proposed cooperation between Mediterranean countries and promotion of a regional action plan for efficient energy management programmes in the cities situated on the Mediterranean Sea. Activities include information exchange, training and development of energy programs and standards, and demonstration and distribution of efficient technologies.

In Egypt OME has funded energy management studies for Alexandria and Mersa Matrouh,[7] that provided technical assistance to OECP and AEDC, with the involvement of EEA and local universities, to conduct total energy and end use analyses of the residential and commercial sectors. The European Community also funded a pilot project (administered with the assistance of ENIN of Italy) in which AEDC purchased and distributed 1000 compact fluorescent lamps (CFLs) that were installed in a residential neighborhood served by one power substation where measurements could be made of the

[7]Other participants include Rabat, Morocco; Algiers, Algeria; Ben Arous, Tunisia; Gaza, Jericho, and Jenin in the Palestinian Territories; Tel Aviv, Israel; Iskenderun, Turkey; and Paphos. Cyprus. This project has emphasized the rational use of electricity and gas. urban energy planning and geographical data bases, promotion of public transport, and municipal solid waste management.

before and after energy and demand requirements. The most recent work involves measurement of the difference in efficiencies between locally-made Egyptian refrigerators and typical international models, called the "gap analysis". OECP hopes the UNDP/GEF project can use this data to make a case for efficiency standards for refrigerators.

This EU project, if it continues, can provide a forum in which Egypt might share the training opportunities and outcomes of its GEF project with other countries in the region that are undertaking similar activities. These would include Morocco, Tunisia and the Palestinian Authority, and possibly Israel.

Upcoming New USAID Project for Energy and the Environment

USAID representatives in Cairo reported that they are starting to plan a new environment and energy policy "umbrella" project that will contain several components, including one for a national energy efficiency strategy. USAID's objective is to build on their past efforts of training and technology demonstration to achieve large scale delivery of services and implementation. As much as possible is to be achieved through the private sector. The new project will be designed by the end of 1997 and, if approved, will be initiated during 1998. The new USAID project may look to OECP to play the lead role as the GOE counterpart, and could also include initiatives with EEA and the EDCs. USAID noted that their approach to recent financial assistance to EEA, and future financial assistance to OECP, is less to provide direct technical assistance, and instead based on a policy of cash transfer when pre-negotiated benchmarks of performance or accomplishments are achieved.

The scope of the GEF project was specifically discussed by the project document preparation team with USAID on two occasions. The consensus was that the GEF project should focus on removing barriers to implementation, especially pertaining to EEA, building and equipment standards, and cogeneration, while the USAID project should focus more on implementation. USAID applauded those activities that would help EEA develop customer services, support ESCO businesses, promote leasing of energy efficient equipment, and address the financial motivation for EDCs to promote efficiency of energy utilization. USAID will focus more of its efforts on achieving energy efficiency among private sector organizations, and is unlikely to address the needs of public sector companies (industries) until such time as they become privately owned. Thus the two projects should be highly complementary.

Renewable Energy — NREA

Two recent donor-assisted projects are targeting the successful achievement of energy efficiency through the use of renewable energy sources for low- and medium-temperature

applications. Both of these applications displace the conventional use of electricity or thermal energy for water heating and steam.

In 1987 the GOE adopted a government code that requires solar domestic hot water heating equipment in all new housing in the new cities. However, it took until now for specifications to be developed to guide what kinds of systems and performance were acceptable. The European Community has provided assistance through Italy for NREA to establish testing facilities for solar technology testing and certification. This experience provides a useful model for the work that will be required to establish testing facilities and certification procedures for energy efficiency equipment standards. In addition, the NREA facilities at the Egyptian Renewable Energy Development Organization (EREDO) center may be of some use in the GEF project, depending on the requirements of equipment testing and certification for energy standards. The EREDO facilities offer indoor, outdoor, and mobile testing capabilities which now are under utilized (ranging in use from 2-20 days per month).The EREDO laboratories do not have accreditation with the Egyptian Institute of Standard Measurement and Calibration nor the Ministry of Scientific Research and Development.

These facilities were established independently of the Ministry of Housing and Construction (responsible for administration of the GOE law requiring solar water heaters in new housing communities' housing), and with little involvement of the EOS. This experience should be closely investigated to determine the most effective way to accomplish the objectives for efficient equipment standards.

Another solar technology project is the promotion of solar industrial process heat (IPH) and waste heat recovery for applications of 80-200 degrees Celsius. Through a project with the African Development Bank that will run from 1996 - 2005, NREA will seek to promote applications of the IPH technology through a technology development plan that includes development of standard designs and case studies of Egyptian applications. Target industries will include food facilities (example poultry processing) and textile plants. The experience of NREA in mapping out its business plan can be considered by EEA as it plans its Energy Center and cogeneration promotion activities under the UNDP/GEF project.

Conclusions

The contribution of all these donor programs has been to successfully demonstrate approaches and technologies for improving the efficiency of energy generation, distribution, and utilization. The GEF program will ensure timely and widespread adaptation of their results within MOEE, EEA, OECP, the Ministry of Housing, and EOS, and will expedite implementation in public and private sector industries. The project is expected to leave behind a trained staff (some supported by the government's

energy sector, and others by the private sector) who will provide the support mechanisms to continue dissemination of energy saving improvements and implementation of specific energy savings projects.

4. Institutional Framework

There are two primary ministries which control ownership and development of the power sector and the oil/gas industry, the Ministry of Electricity and Energy and the Ministry of Petroleum (MOP), respectively. Within the MOEE, there are seven authorities, which include EEA, responsible for generation and transmission, and NREA, charged with research and development and commercial application of renewable technologies (both electric and thermal). EEA also delivers power to approximately 40-50 high voltage power users, such as large steel and aluminum plants, accounting for 20-25% of total electric consumption. The remainder of power distribution on 11 kV and lower voltage lines is the responsibility of eight Electric Distribution Companies (EDCs). These were removed from the jurisdiction of MOEE in 1991 when they were transferred to the Ministry of Public Business Sector and Administration in anticipation of being converted into private enterprises. None of the EDCs has yet become private.

There is as yet no specialized regulatory structure to oversee the power or oil/gas sectors. The President and Cabinet make most decisions regarding policy, investment, and tariffs. A Supreme Council of Energy was created on paper several years ago, but never meets, thus denying any overall coordination mechanism across energy ministries. All energy sources (including oil, gas, and electricity) have average tariffs that now approach 100% of marginal costs. However, due to problems of cross-subsidization and substantial non-payment by public sector industries, and the EDCs' consequent underpayment for power purchased from EEA, EEA's revenues are not sufficient to generate the cash required for investment in new generation and transmission. In the spring of 1997, EEA entertained its first solicitation for 300 MW of power generation from private developers on a build-operate-transfer (BOT) basis. This is the beginning of a new commitment by EEA to have all new major power plants developed through private investment.

OECP, which is fairly independent but administratively tied to the MOP, has been a focal point for non-electrical energy planning and utilization analysis. Most of its work involves studies and analysis; there is no authority to administer policy nor initiate implementation activities.

The World Bank recently performed an Energy Sector Assessment of the Egyptian energy sector in a joint task force which included senior officials from the Ministry of Electricity and Energy, the Ministry of Petroleum, all sector operating entities and a World Bank Energy Sector Management Assistance Program (ESMAP) team. The assessment covered the following core topics: energy economic linkages, power sector

development, energy conservation and environmental protection, and new and renewable sources of energy. The following excerpted findings and recommendations of the assessment pertain to the UNDP/GEF project.

Excerpt Findings from the *Arab Republic of Egypt Energy Sector Assessment*, by ESMAP (1996):

The current institutional framework of the energy sector is inadequate to meet the government's objectives. ... [Necessary changes in] institutional actions include:

- Move to private sector participation in energy sector operations,
- corporatization and commercialization of energy sector enterprises
- independent and transparent regulatory process based upon competition and market-oriented operations
- a sustainable and dynamic energy policy

Currently, EEA and EGPC are fully controlled by the government; They lack autonomy in management and commercial focus....Other energy operating entities, such as the power distribution companies, petroleum, and gas distribution companies are directly controlled by EEA or EGPC and thus indirectly controlled by the government. The companies operation on the basis of an average profit margin, and lack the motivation to operate efficiently. [Although] electric, petroleum, and gas tariffs all come close to 100 percent of their economic costs, micro-level pricing structures have not been addressed adequately, and subsidies and cross-subsidies have not yet been completely eliminated.

In the power sector, operational efficiency is below potential because of transmission network constraints and dispatching limitations. The doubling of gas reserves has lowered the marginal cost in the power sector, and as a result brought tariffs closer to marginal costs. Yet because of remaining cross-subsidies, tariff levels are inadequate to generate sufficient financial resources for future investment needs. Investment planning is hampered by a demand estimation process which hither to has not included actual field surveys for residential and industrial consumers, who account for about 70 percent of electricity consumption. The distribution companies are expected to be privatized eventually, but in the meantime have little capital to invest in improving the distribution networks.

Even once private sector participation in the power sector occurs, there would still be a role for the government in key areas such as

- facilitating innovative financing mechanisms such as guarantee programs
- promoting local private sector involvement,
- protecting poorer sections of society during the reform process.

A coordinated effort should put in place an appropriate institutional framework for effectively managing the several efficiency improvement programs already in place, and those being planned. An updated vision and action-oriented strategy should be developed by all stakeholders for promoting energy conservation through the Organization for Energy Conservation and Planning (OECP) and linked to the overall national energy strategy. The strategy should consider a wide range of programs in three key sectors: industry, buildings

(residential and commercial), and transport. The buildings and transport sectors offer significant conservation potential, but are hardly addressed at all.

This effort and strategy should also take into account the barriers to enhanced energy conservation ... strengthening the institutional framework, and introducing innovative techniques for financing energy conservation programs, including private sector involvement and suitable payback mechanisms. ...[Other significant] issues in energy conservation include absence of incentives for development of local manufacturing industries; high duties on imported equipment; and shortage of energy conservation professionals and experience in Egypt. The latter involves insufficient trained personnel within industry, and a weak network of consultants, contract energy management companies and equipment suppliers.

Until a strategy for energy conservation is established and supported, the potential benefits for energy conservation are unlikely to be realized. Several options can be proposed ...:

Reinforce and strengthen the role of OECP as the central coordinating body
Expand the role of MOEE to include energy conservation
Take no initiative and assume that increased prices will accelerate market mechanisms to enhance uptake of energy conservation.

Egyptian Electricity Authority

History and Current Status

The Egyptian Electricity Authority is a publicly-owned enterprise that encompasses the electric power generating and transmission system of Egypt incorporating hydroelectric, thermal, and internal combustion engine systems integrated within a steadily expanding UPS. EEA's developing experience in managing the UPS through all its growth and improvement stages can be traced back to the 1960s. Since that time, major growth in generating capacity, transmission systems, telemetry, computer modeling, and energy management have brought the system to its present status.

EEA has responsibility for the country's power sector resource planning, including making a load forecast, performing assessments of system reliability, planing for capacity additions and retirements to the system, and selecting fuel mix for the generating stations. Its leadership structure consists of a Chairman who reports to the Minister of Electricity and Energy and an EEA Board of Directors. Two chairmen of electric distribution companies sit on the Board. The Chairman is assisted by five Deputy Chairman (for Administration and Training, Financial and Economic Affairs, Operation, Planning - Studies & Design, and Projects. EEA conducts its generation and transmission responsibilities through seven regional zones.

There is a very strong linkage between the Government and EEA on matters of planning, tariff setting, and policy-making. There is no effective commercial status to EEA,

although the announcement of the new Regulatory Authority late in 1996 holds out the possibility that there will be a greater degree of autonomy from the Government in the future. Until 1996 EEA had sole authority for any power generation in the country used off-site. A 1996 law changed this to allow private entities to produce power if it is sold to EEA for subsequent transmission and sale.

Although EEA can recommend electric wholesale and retail tariffs to the Minister, who in turn takes these issues to the Cabinet, EEA has no authority to set rates nor the terms of wholesale power transactions with the EDCs. The EEA forecast is done for the entire country and then allocated to its zones. No such demand planning is performed by the EDCs, largely due to their lack of technical expertise, and the absence of any need to make commitments to EEA for capacity or power purchase amounts. The forecast is a top-down macro-economic forecast. There is very limited data from load research to understand on a sectoral level the contributions of classes (industrial, commercial, governmental, residential) to demand by time of day or by season. There is no data to inform EEA about end use contributions to demand, nor to changes in the saturations of electrical appliances and equipment. To this date, EEA's resource planning has not incorporated the potential contributions of load management, time-of-use tariffs, nor customer-side energy efficiency into its resource options.

Load Management

As was described in Section A3, EEA has received assistance from the Electricity Supply Board of Ireland in performing a focused study of load management and time-differentiated costs of supply. Several EDCs, as well as EEA, cooperated in the study which focused on the cement industry. Daily demand patterns of cement plants were explored and measurements were recorded over a long period of time to characterize daily electricity utilization and to see how the cement industry could modify its daily demand to shift load out of the peak period, without compromising productivity. Recommendations included development of a Time-of-Use electric tariff to encourage the shifting of a portion of the demand to off-peak periods.

At this time EEA has purchased 500 TOU meters for installation on the largest EEA direct-served customers (most customers take power at more than one meter). Some unallocated meters may be available for use by EDCs. However, there is no authorized TOU tariff, since EEA has not received Cabinet approval for such a rate. Thus the TOU meters can be used only for "load research" information, and not for billing purposes. In the absence of a TOU tariff, there is no program for information and technical assistance to large customers to identify opportunities to shift portions of their electrical loads to off-peak hours. There also are neither capacity nor TOU dimensions to the prices at which EEA sells power to EDCs, removing any motivation on the part of the EDCs to manage their distribution systems to manage peak demand.

Institutional Capabilities

During a period of almost twenty years, support from USAID has shifted in emphasis from construction of new generating facilities to strengthening of internal administrative and management capabilities. Although the emerging organization is far better optimized to serve the power generation and transmission requirements for the economic and developmental environment of Egypt, there are still pockets of improvement required in load research, forecasting, demand planning, tariff design, billing, customer service, and distribution system efficiency. In the continuing evolution of USAID assistance, it is likely that future emphasis will continue shifting to the areas of greatest need, which are expected to emphasize management, billing, and distribution system improvements.

Tariff Regulation

Creation of a new regulatory authority for the power sector was announced in December, 1996. Responsibilities are to include "regulating and controlling everything related to electric energy production, transmission, distribution, and consumption that will ensure power availability and stability to meet the (usage) requirements within the easiest terms and the most appropriate prices." This is a necessary step in overall management of the electricity sector as progress is made toward eventual privatization. The regulatory authority will have jurisdiction over both wholesale and retail pricing. It also has a mandate to analyze consumption in relation to "the policy of rationalizing energy consumption" and "laying down restrictions to protect the environment and the public". At the time of writing, the regulatory authority was still awaiting the appointment of its members and staff by ministerial decree or other means. It remains to be seen how independent this authority will be from political appointments or associations with leaders of the executive agencies of the government.

Customer Service

In fulfillment of its mandate to serve Egypt's needs for power, EEA has embarked on a path to develop new capabilities for providing customer service functions. These customer service functions were heretofore unavailable, and their provision represents removal of certain barriers toward more effective and efficient utilization of energy resources, resulting in a more reliable and supportive operating environment for industry and commerce.

Demand Side Management

EEA has no demand side management (DSM) activities of its own. It has sent a considerable number of employees for DSM training programs locally, as well as in Europe and the U.S. EEA has been a recent participant in the USAID/ECEP DSM pilot program in Alexandria and Cairo. In the program, EDCs are free to undertake various DSM activities on a pilot basis. EEA has stated that it carries the primary responsibility to ensure transfer of DSM activities within the entire UPS, including EEA's seven zones and their support services to the EDCs. EEA also has stated it is the ultimate responsibility of the EDCs to implement any DSM activities that are utility-sponsored. At this time neither EEA nor the EDCs have any national plan for DSM. EEA expects to upgrade its staff knowledge and analytical skills on this subject through the USAID Consultant and Construction Management Services project (described in Section A3).

Cogeneration and Use of Agricultural Waste Fuels

Lack of Advocacy for Cogeneration

Cogeneration combines the generation of electricity with the recovery of waste heat for productive purposes. Small cogeneration systems, for example, can provide individual factories with 1 to 10 MW of electric power, and through recovery of waste heat from the generating equipment for steam generation, process heating, or absorption chilling, etc., eliminate the use of other fuels. Such systems can dramatically reduce the total cost of energy.

In the course of its industrial energy audit work, OECP developed the first national estimate of economical cogeneration potential (defined as having a 2.5 - 3.5 year simple payback). This amounted to 4.8 million TOE per year of savings by the year 2005, equivalent to 44 percent of industrial electricity consumption.[8] Two industrial firms that have undertaken cogeneration systems have succeeded in negotiating an agreement with EEA to sell surplus power back to the power grid.
Cogeneration is proving increasingly advantageous in developing countries, yet within Egypt, a constituency has yet to be developed for achieving the potential improvement in use of energy resources and associated GHG reduction. Cogeneration bridges the responsibilities of several agencies and ministries in Egypt whose interests are more narrowly focused on industry, agriculture, fuel, renewable energy, and electricity. This project seeks to remove the barrier to more effective advocacy of cogeneration.

[8]Egyptian National Committee - World Energy Council, "Technological Methods of Energy Conservation in Non-Petroleum Industries in Egypt," May 1994.

The USAID/ECEP project has effectively demonstrated cogeneration in a factory operating environment, and confirmed its cost-effectiveness. Unfortunately, an effective means for replicating and transferring the lessons to other factories, including information on local and regional sources of equipment and technical expertise, was not part of the USAID project. In addition, the demonstrations were based on premium fuels (solar and natural gas); no demonstration was provided based on mazout or on available agro-waste fuels, which are suitable and practical for cogeneration systems. It is out of this environment that the present project seeks to establish an energy service function to assist in planning cogeneration projects that incorporate efficient use of total energy resources, cogeneration, and use of agro-waste fuels, with the potential for sale of surplus electricity to EEA, as well.

Large and Small Power Plants

EEA and the UPS are similar to other networks in developing countries based on large, efficient, power plants connected by a transmission network and dispatched according to least cost, within the limitation of peaking capacity and reserve requirements. Small power plants connected into the system can, in the aggregate, provide significant additional generation, often at a cost lower than the avoided cost of generation in the network, because the small power plants incorporate cogeneration or the use of an agro-waste fuel. Small power plants can also improve reliability and the quality of service, particularly at the end of long, radial distribution lines where regulation is poor. EEA neither designed nor maintained the capacity to serve a multiplicity of small power producers during the years in which the network grew rapidly and the primary responsibility was to provide large amounts of new capacity to serve the needs of a growing population and growing economy. The benefits to be realized from encouraging small power production with respect to national energy efficiency and greenhouse gas reduction require institutional capacity building within EEA in the areas of cogeneration, alternative fuels, safety and interconnection, customer service, tariffs, and power purchase agreements.

Utilization of Energy — OECP

OECP is under the administrative control of the Ministry of Petroleum, but operates autonomously through its separate budget and board members nominated by the OECP Chairman (presented to the Minister of Electricity and then the Minister of Petroleum for their formal approval). Board members include the First Deputy Undersecretary of the MOEE, EEAA Chairman, Minister of Finance, Minister of Planning, representative of the National Investment Bank and State Council, Chairman of Parliament Committee on Energy and Industry, and two OECP staff members. Board resolutions require no further approval.

About 30% of OECP activities pertain to energy conservation. Energy conservation activities were begun in the 1980s when OECP (then the Organization for Energy Planning) developed a plan and undertook energy audits in major industrial facilities to cope with the acute need for energy conservation. Over the ensuing ten to fifteen years a large number of activities targeted at the efficient use of energy emerged. Today OECP's role emphasizes the direction of studies, serving as a catalyst for new ideas and concepts through the support of exploratory investigations, followed by publicity and further grant-seeking. It has little to no implementation authority nor experience.

Recent activities include:

public awareness activities and school programs to promote ideas for energy management and to inform the public of the associated environmental benefits

investigations into the possibility of energy efficiency equipment standards

promotion of basic education and awareness about climatically-appropriate design of new buildings (through its Green Architecture project)

participation in OME studies of energy end use in Alexandria, including developing information on typical appliance energy use in Egypt

In the last two years OECP has taken the lead role in preparations for Egypt's National Climate Change Action Plan that will describe the country's specific policies and programs that will be implemented to reduce greenhouse gas emissions, preserve GHG sinks, and adapt to the potential impacts of climate change. OECP's work has emphasized addressing problems and opportunities outside the energy sector.

In parallel to this effort, OECP is coordinating work among many organizations to prepare a National Strategy for Improving Energy Efficiency in Egypt. The draft outline of the strategy calls for institution building, legislation, national standards for energy efficiency in equipment and vehicles, training and education, publicity to build public awareness of the important of using energy efficiently, and development of financial tools to encourage investment in efficiency. There is as yet no specific institutional assignment or mechanism identified to accomplish these objectives among the many potentially contributing organizations.

Utilization and User Interface — Electric Distribution Companies

There is a sense in Egypt's power sector that the EDCs have been left on their own, no longer having close access to the Ministry of Electricity, no longer in close association with EEA, and unable to collect sufficient revenues to maintain, upgrade, and expand the local power distribution system. There are no formal contractual agreements between

EEA and the EDCs for buying and selling of electricity. There is no transparency to the wholesale prices for power the EDCs buy from EEA. The Minister of Finance and Cabinet decides the price on the basis of "guaranteeing" an average margin of 8-10 percent profit on each EDC's sales base, looking at the mix of customers and the corresponding national retail tariffs set for each customer class. In reality, the substantial non-payment of bills by government-owned industries puts the EDCs at a significant revenue disadvantage. Consequently, they have not been paying their full bills to EEA.

The EDCs have been largely ignored by the international donor community, receiving no technical or financial assistance since the EDCs were shifted to the Ministry of Public Business. One exception is a hold-over distribution system improvement project that was started by USAID while the Alexandria EDC was still in the Ministry of Electricity. As a result, the EDCs lack the funds and knowledge required to accomplish distribution system operating efficiency, and improve billing and collections from customers.

As government-owned power distribution organizations, the idea of "customer service" is new to most EDCs, with the exception of Alexandria, whose Chairman visited the U.S. during the oil crises of the 1970s and witnessed the customer programs developed by U.S. utilities for their customers. Alexandria EDC has undertaken several customer service and energy efficiency pilot activities including industrial energy audits, technical assistance to customers with power factor correction, and a demonstration program that distributed CFLs to residential households. AEDC is also participating in a USAID-funded pilot project to demonstrate the potential of DSM among industrial customers, and to bring multiple parties (EDCs, EEA, and OECP) together to accomplish the program, assisted by technical guidance and information developed through USAID/ECEP's commercial and industrial efficiency activities.

It has become clear to the EDCs that two potential applications of energy efficiency could be financially beneficial to them. The first is conservation targeted at subsidized rate classes from which the EDCs now incur large losses (thus diminishing the proportion of sales sold below cost). The second is revenue-producing opportunities to offer customers fee-for-service energy management assistance. Although each is promising to the EDCs, there is no guarantee of beneficial UPS system impacts unless the EDC services take peak load considerations into effect. For this to occur, there must be adequate coordination, and possibly economic incentives, between the EDCs and EEA.

Energy Users, Equipment Suppliers, and Energy Service Professionals

There is limited focus on energy utilization or cogeneration development among large industrial and commercial enterprises. Public sector industries, for the most part, are in financial trouble. Only privately-owned industries and commercial businesses have much of a motivation to consider energy efficiency, in part due to their private ownership, and

in part because they pay higher electricity prices than most other electric consumers. Most residential consumers and many large industrial organizations in the public sector are paying subsidized prices for their electricity, and have far less incentive to invest in energy efficiency.

Currently the technical expertise for energy management services resides in government- and donor-supported organizations (such as OECP, DRTPC, and TIMS), and by a small number of private consulting and engineering organizations. The latter are typically retained to design new industrial development or new tourist complexes, especially those with foreign investment; or to export their knowledge to other countries in the region. They are not frequently hired to advise on energy efficiency retrofit of existing local industry. If the demand for retrofit services materializes, local engineering companies will need to develop more skills and adapt their business service offerings accordingly. These firms will need to package their expertise with turnkey equipment sales and/or offer financing terms, for instance.[9]

For the technologies offering the greatest potential for energy efficiency (electrical lighting, motors, refrigerators; thermal equipment for combustion, heating, and controls), the total size of the potential Egyptian market is LE 3.6 billion ($1.1 billion). [10] The vast majority of these types of equipment is now locally manufactured, but local manufacturers produce very little in the way of energy efficient models. The manufacturers have indicated they would produce more efficient equipment if market demand were to emerge.[11] In the meantime, much of the energy efficient equipment that could be imported is subject to substantial customs tariffs.

Technical Standards for Energy-Using Appliances and Equipment

The Egyptian Organization for Standards, within the Ministry of Industry, has responsibility for setting standards in Egypt. Their focus so far has been on standards for human health and safety, and for international compatibility of equipment. There are no energy efficiency standards in Egypt. EOS does not have an extensive staff of technical experts. It is an agency that administers standards, typically developed by EOS convening committees of interested parties (manufacturers, university professors, and others) to review and modify international standards for application in Egypt. A major organization

[9]Hagler Bailly Consulting and Overseas Bechtel, *Energy Efficiency Business Profile*, prepared for USAID/Cairo ECEP project, 1995.

[10]Hagler Bailly Consulting and Overseas Bechtel, *Energy Efficiency Business Profile*, prepared for USAID/Cairo ECEP project, 1995.

[11]Hagler Bailly Services, *DSM Implementation: Institutional Capability Assessment*, prepared for USAID/Cairo ECEP project, January 1997.

that participates in this process is the Egyptian chapter of the International Electro-technical Committee, affiliated with the International Standards Organization.

Building Construction Standards

Technical regulations and construction requirements for buildings are the responsibility of the Ministry of Housing & Construction. As is the case for equipment standards, building codes in Egypt focus primarily on occupant health and safety, and structural integrity issues. Even those standards that exist are poorly enforced. Recent occasions of building collapse and injuries have brought this problem to the attention of the public and government officials. There are no Egyptian codes or standards for overall energy efficiency in buildings, although there is research on energy efficient building design performed at the Ministry's Building Research Center. Their research staff and professors are attempting to introduce the concept of climate-appropriate building design and energy efficiency in some introductory seminars sponsored in coordination with OECP's Green Architecture project.

There is one specific regulation from 1987 requiring solar water heaters to be installed on residential buildings in new government-developed communities. This requirement has had mixed success because the Ministry of Housing lacked expertise in the technology, or how to administer the requirement. The NREA within the MOEE had expertise to offer, but no authority to develop essential programs for publicity, quality control of manufacturing or installation, testing and certification standards. This experience offers valuable local lessons to be understood and applied on the UNDP/GEF project.

Conclusions for Consideration in GEF Project Design

In an institutional sense, there appears to be no effective overall coordination mechanism for energy policy and strategy development. There are several exceptions, such as the extent to which organizations have willingly cooperated in the past development of Egypt's 5-year national development plans, and the fact that several organizations collaborated to secure the current UNDP/GEF project. Even on an informal level, there is very poor coordination between MOEE (and EEA) and OECP, or between EEA and the EDCs (once the latter were moved into the Ministry of Public Business). Most emphasis of the GOE power sector organizations has been on power supply and delivery, but not on efficient utilization, nor attending to the bill payment problem from government sector industries. The past energy price subsidies, government-control of the power sector, and continued government ownership of major industrial companies has made it difficult for a private market demand for energy efficiency to emerge.

A more recent convergence of changes in the general economy, power sector, and environmental objectives make this an excellent time to launch the UNDP/GEF project to remove remaining barriers to improved energy efficiency and reduce greenhouse gases. In the past two years, GOE has overseen the elimination of the worst power tariff subsides, EEA's commitment to adopt commercial operating principles and some private investment in the power sector, invigorated efforts to place more public industries into private ownership, and preparatory work on a national action plan for climate change.

All of the above institutional factors were taken into consideration in program design and assignment of institutional responsibilities for UNDP/GEF project. Emphasis of the project will be placed on building capabilities within EEA and the EDCs, stimulating a private market in energy efficiency services, and providing a mandate to OECP to work with the Ministry of Housing (and its Building Research Center) and the Ministry of Industry (and its EOS) to develop codes and standards that will improve the efficiency of energy utilization in new buildings and new equipment. Specific needs and their expected treatment include:

1. Improvements to the EEA transmission system and introduction of load management in Component 1 of the project will bring greater efficiency to the Universal Power System.
2. The GEF project emphasis on energy efficiency is being coordinated with internal initiatives at EEA to address customer services and among the EDCs to address the need for new services and revenue enhancements with customers, and external donor efforts by USAID to achieve overall progress with energy and environmental policies in Egypt.
3. The UPS system will have the greatest potential for efficiency when EEA and the EDCs cooperate on load management, utilization efficiency, and local cogeneration opportunities, as activities will permit in all three components.
4. There is a need for government sector initiative to stimulate a market demand for energy efficiency services, and this will be addressed by Component 2. This is complementary to the USAID intent to focus its technical and financial assistance on energy efficiency to private sector implementation initiatives.
5. Component 2 of this project will offer support to attract local and foreign engineering organizations and technical service businesses to delivery energy services in Egypt.
6. New solutions to financing mechanisms for energy efficiency will be pursued through Component 2.
7. The development of energy efficiency standards and codes for new equipment and new buildings will address not only technical standards, but also local manufacturing and construction capabilities, and enforcement mechanisms.

It is important to state that the UNDP/GEF project on its own cannot solve the GOE's need to define a more effective institutional framework for energy efficiency and environmental protection. Yet it is certainly hoped that the experience in designing, managing, and coordinating the GEF project activities can contribute to a clearer sense of how the country's organizations can develop a clear energy strategy and action plans.

Section B: PROJECT JUSTIFICATION

1. Problem To Be Addressed: The Present Situation

Egypt is well-endowed with energy resources in the form of oil, natural gas, and hydro power. The resources are available for meeting expanding energy requirements as the economy grows and changes with movement towards deregulation, restructuring, and privatization. Unfortunately, the abundance of resources and the historically low energy prices have contributed to an over-utilization of resources in relationship to other economic indicators. Primary energy consumption increased by 30% from 1983/84 to 1992/93, a compounded yearly growth of about 3.3%, exceeding the compounded population growth of 2.8%. Primary energy use per capita in 1992 was about 586 kg oil equivalent, which is 50% greater than for other countries at similar states of economic development.[1] There is a clear opportunity to reduce per capita consumption of energy resources, and in the process, achieve benefits to the global environment through improved utilization (or end-use) efficiency, by reducing losses, developing renewable resources, and applying more modern techniques of cogeneration, all of which imply a beneficial reduction in the emission of greenhouse gases. In particular, there is an abundant biomass from agricultural waste which is largely unexploited, yet which represents an additional fuel resource with direct benefit to greenhouse gas (GHG) reduction to the extent that it replaces fossil resources.

Against a background of energy abundance, the electricity sector, which accounts for 31% of total fuel consumption, has nonetheless made several notable achievements, resulting in a 30% improvement in thermal efficiency of power generation from about 24% in 1982 to about 33% in 1994; reduction in system losses (technical and non-technical) from about 18% in 1984 to about 14% in 1994; and the unbundling of power distribution by placing the eight energy distribution companies (EDCs) under a separate holding company.[2] In the 1995/96 operating year, thermal efficiency reached 38.9%,[3] and estimated losses in the transmission system alone, were slightly less than 7%, a creditable value for a system with very long transmission paths for the amount of total generation.

Even in the time since initial preparation of the project brief, significant improvements have occurred with direct benefit to greenhouse gas reduction associated with the shift from thermal generation based primarily on heavy oil (mazout) to generation based primarily on natural gas, and including significant new generation in very efficient, gas turbine combined cycle units. In 1995/96, fuel consumption for thermal power

[1] ESMAP, *Arab Republic of Egypt: Energy Sector Assessment*, World Bank Report No. 189/96.

[2] Ibid.

MOEE/EEA, *Annual Report of Electric Statistics, Arab Republic of Egypt*, 1996.

generation was 27% mazout and 73% natural gas. As a consequence, several of the previously anticipated reductions in greenhouse gas emissions are recalculated in the present document, in order to acknowledge the intervening generation fuel mix improvements.

Perhaps most important in motivating a new attitude toward energy efficiency has been the approach of energy prices toward actual market value. In the case of electricity, USAID currently estimates that the average tariff for electricity sales across all consuming sectors has reached 80% of the long run marginal cost (LRMC). EEA has a different estimate, claiming that the average price has already exceeded the LRMC. The difference appears to be associated with the manner in which the fuel price component of LRMC is determined. In any event, progress toward the LRMC is substantial and now at levels which encourage energy efficiency and offer the potential of good payback on investments in small power systems based on cogeneration.

In the past year, the Government of Egypt, the Ministry of Electricity and Energy and EEA have undertaken major strides in their strategy toward finding the lowest cost supply-side resources. Law No. 100 of 1996 was established to allow private power developers to build, operate and maintain power generation stations in Egypt. EEA issued its first solicitation for new power resources competitively bid under a BOT mechanism in 1996/97.

On the demand or customer-side, EEA has acquired nearly 500 time-of-use meters intended for the largest power users in the country, and has begun installation on the nearly 60 industrial facilities receiving power directly from EEA.[4] These meters can record power use in peak and off-peak hours, which will allow a differential price for power matched to the time-of-day differential in LRMC. Unfortunately there is not yet agreement within the government to adopt the time-of-use electric tariff needed to fully apply the TOU meters.

It is hoped this tariff adoption impasse will be rectified by another significant development — the announcement in December 1996 that the government will create a regulatory body to oversee the development and operation of the electricity sector and service to customers. The regulatory organization is expected to be formed in 1997 and will encompass such duties as licensing production, transmission, and distribution; monitoring power sector investments, approving both wholesale and retail tariffs, establishing uniform rules for all parties working in the electricity sector, and overseeing progress with the rationalization of energy consumption.

[4]Many of these facilities take power at more than one point, and require multiple meters.

Within respect to institutional issues, the present situation is that EEA has built its capacity effectively in many areas of technology, management, training, and economic analysis through organizational maturity and with the support of continuing donor activities, and can provide the role of primary agency for project implementation. This fulfills the UNDP/GEF requirement that the project be executed nationally.

Potential for Improved Efficiency

Transmission Efficiency

EEA has made significant progress to bring current transmission efficiency down to under 7%. The transmission systems in most industrialized countries typically have an efficiency of 5%. EEA has set its goal on improving its system to match these international levels.

End-Use Efficiency and Load Management

The combined objective of end-use efficiency and load management is commonly referred to as demand-side management (DSM). This can provide many benefits to Egypt, including lower energy bills for households and businesses, lower operating and capital costs for the electric utilities, better use of foreign exchange, and improved air quality. Over the next decade, DSM offers the potential to save at least 15% of the electrical energy consumption through economically viable investments. These savings vary by sector. The industrial sector accounts for 63% of the savings potential, and is followed by the residential sector with 24% and the commercial sector with 12%. Translated into electrical demand, the end-use efficiency amounts to the equivalent of 800-3,000 MW of capacity.[5] (The upper range is the amount of efficiency that is economically viable, while the lower end of the range is the proportion that might be practically achieved by normal operation of a private energy services market in pursuit of energy users. Most government policy deliberations focus on initiatives that might achieve more than the lower end of the range.) The Organization of Energy Conservation and Planning estimates energy efficiency can be improved by up to 25% of total annual consumption, worth $850 million in energy bill savings each year. [6] The ESMAP report estimates energy conservation potential as 35-45% of primary energy consumption, equivalent to 11-14 million TOE of annual savings.[7] It is clear there is substantial

[5]Overseas Bechtel, Inc. and RCG/Hagler Bailly, Inc., *Assessment of Demand-Side Management (DSM) Potential in Egypt*, prepared for U. S. Agency for International Development, December 1994.

[6]Organization of Energy Conservation and Planning, *National Strategy for Improving Energy efficiency in Egypt*, draft, June 1996.

[7]ESMAP, *Arab Republic of Egypt Energy Sector Assessment*, 1996

potential for cost-effective end-use efficiency, and only extensive implementation experience will reveal the true upper bounds of the potential.

Cogeneration

The estimate of economic potential (defined as having a 2.5 - 3.5 year simple payback) for cogeneration in the industrial sector amounts to 4.8 MMTOE per year of energy savings by the year 2005, equivalent to 44 percent of industrial electricity consumption.[8] This is equivalent to an estimated 1000 MW of power generating capacity (with estimates ranging from the economic potential of 1,700 MW to a conservative estimate that 25% of this, or 400 MW might actually be developed.)[9]

There is also potential for cogeneration using agricultural waste. The GEF project brief identified the potential GHG reductions associated with the purchase of surplus electricity from the sugar industry. In the absence of an infrastructure for the sale of surplus electricity, the sugar industry is starting to use excess bagasse as feedstock for making paper products. However, approximately 20% of the potential surplus generation can be produced by energy savings within the sugar factory without consuming any additional bagasse. The economic value of bagasse as an energy fuel, based on the experience in other countries, is considerably higher than its value as paper feedstock; it is highly likely that much of the excess bagasse may still be available for electricity generation.

NREA has estimated the agricultural waste available for power generation from several additional crops at approximately 5.3 million tons per year (dry basis) after deduction of the amount customarily utilized for animal fodder and other incidental uses. (These figures were not available for preparation of the project brief.) In addition, NREA has an operating pilot demonstration of a briquetting technique which effectively addresses the issue of collection and transport of the low density agricultural waste materials. The major waste streams on a dry basis are from cotton (1.24 million tons per year), rice (1.9 MTY), maize (4.21 MTY), wheat and barley (3.36 MTY). In the case of cotton, it is presently mandated that all cotton stalks must be burned because of a cotton worm which could damage future crops. The aggregated potential for practically realizable electricity generation from agricultural waste fuels is estimated to be 600 MW.

Leadership and Mobilization of Talent

It is clear that substantial interest and basic capabilities exist in Egypt and that there have been sufficient "proofs of concept" that efficiency can be accomplished in all energy

[8]Egyptian National Committee - World Energy Council, "Technological Methods of Energy Conservation in Non-Petroleum Industries in Egypt," May 1994.

[9]*Assessment of Demand-Side Management (DSM) Potential in Egypt*, USAID, December 1994.

using sectors. The greatest need to approach the opportunities for efficiency in energy use are for a combination of leadership, development of more-in-depth knowledge of technical solutions, and mobilization of public and private organizations to promote and invest in energy efficiency. It is timely to proceed, to build on accomplishments of previous donor and in-country programs, and to work toward improvements in energy efficiency and reduction of GHG emissions. It is expected that this progress can be accomplished through GOE programs, private sector initiatives, supported by the GEF project, and continuing assistance from USAID and the European Community.

The Barriers Preventing Progress Toward this Potential

A number of barriers remain to be overcome in achieving the substantial potential for efficiency improvements. These barriers can be either removed or bypassed with alternative strategies.

Loss Reduction in the UPS Transmission System

The barriers to further loss reduction in the UPS transmission system from approximately 7% to the target value of 5% relate to the need for improved network loss measurement capability, the need for improved dynamic response of thermal generating units, and the need for specialized computer control strategies (software) for network dispatch. Objectives 1, 2, and 3 of Component 1 address these needs.

Load Management by Reduction in Peak Demand for Electricity

The barriers to reduction in the daily peak demand for electricity, which averages approximately 50% of the average demand, relate to the lack of a tariff incentive (time-of-day tariff) for reducing demand during the peak periods or shifting demand to an off-peak time, and the lack of an effective customer technical assistance service to help guide large energy users in how to reduce both their peak and average demand. In the case of industrial customers (not directly connected to the UPS), the barrier includes the lack of an effective linkage with the EDCs for dealing with time-of-use meters and tariffs. In addition, there are certain technical barriers to EEA and the EDCs in installation and application of the TOU meters and associated billing systems. These barriers are amenable to elimination, and are dealt with in Objective 4 of Component 1, and in Component 2.

In the case of residential customers, whose average tariff is approximately one-half of the LRMC,[10] any suggestion that could possibly result in an increase of tariff is viewed with

[10]Residential electric consumers using up to 200 kWh per month pay between 5 and 8 piastres per kWh, while each kWh in excess of 200 kWh/month costs 11-25 piastres, depending on the total amount used. The average price per kWh used by residential households is approximately 8 piastres. Estimates of the electric marginal cost that are quoted by different sources range between 12-17 piastres per kWh.

great alarm. It is unrealistic to expect meaningful tariff reform in this sector, but the issue will begin to be addressed in Component 1 tariff studies.

Achieving End-Use Efficiency

Barriers to achieving the energy efficiency potential involve both market-related issues and institutional issues. The market barriers prevent consumers from buying energy efficient products and services; the institutional barriers prevent energy institutions from promoting energy efficiency.

Five primary market barriers have been identified in Egypt:

1) low consumer awareness of the benefits of specific energy efficiency technologies and practices;
2) little apparent consumer interest in buying these technologies or adopting these practices;
3) reluctance to commit capital to energy efficiency projects offering 2-3 year payback periods;
4) risk aversion towards investing in new technologies; and
5) inadequate maturity of the market infrastructure, manifested primarily in poor availability of efficient equipment and tradespeople to support the installation and maintenance of such equipment.[11]

Five institutional barriers have also been identified:

1) lack of explicit national policy for energy efficiency at end-use level;
2) an incomplete transition to cost-based electric tariffs for most residential and some industrial customers; sector;
3) dilution of institutional oversight for energy utilization;
4) poor availability of credit in the Egyptian economy; and
5) lack of application of modern management skills in public sector enterprises.

The lack of explicit national policy has left many opportunities sitting idly, waiting for public or private organizations to seize upon them and exploit the potential benefits. For example, although EEA staff have received training and analytical tools to perform integrated resource planning and demand side management planning, there is no established procedure to consider these possibilities in the power sector forecast and resource plans. Likewise, the potential for cogeneration is well-known, but not exploited

[11]Hagler Bailly Services, Inc., *DSM Implementation: Institutional Capability Assessment*, prepared for USAID Energy Conservation and Environment Project. January 1997.

as a potential source of low cost electricity. There is a critical need to forge links between theoretical knowledge, and its mobilization in the form of specific plans and investment vehicles.[12]

A related link that must be forged is between the generation and transmission role of EEA and the low voltage power distribution and customer service delivery of the EDCs. Currently the two are in separate ministries; there are no specific contractual relations between them; the structure of wholesale power rates is flat and offers no incentive for the EDCs to apply load management principle;, and wholesale tariffs are negotiated by the government to permit a chance to break even or make small profit. There is no structural or institutional motivation for EDCs to promote efficiency and load management, except among subsidized rate classes where the EDCs lose money by having to sell electricity at less than its purchase cost.

The current energy utilization situation also is exacerbated by the fact that now many large public sector firms are not paying their power bills, may have low efficiencies in energy utilization, and face considerable uncertainty regarding the likely commercialization or privatization of their enterprises. The project will seek to establish an energy efficiency loan guarantee fund that would be offered to those enterprises paying their power bills to undertake efficiency improvements offering paybacks of three years or less.

Component 2 addresses nine of these ten barriers to energy utilization efficiency (the GEF project does not address the lack of modern management skills in public sector enterprises) through the introduction of information and awareness activities, business development support to businesses interested in entering or expanding the energy service business, development of codes and standards for efficient energy use by new equipment and buildings, and institutionalizing the learning and information in power sector planning and the development and eventual execution of a national energy strategy.

Lack of Institutional Support for Cogeneration

The barriers to development of cogeneration by the industrial and commercial sectors are the lack of institutional support both within government (buy-back tariff for surplus generation, modeling of technical and financial impacts for the UPS) and within the private sector (knowledge of biomass cogeneration possibilities, technical and economic assessment of feasibility), and lack of the required infrastructure within which a new business venture can become established (for example, dealing with issues of biomass collection, compaction, and storage).

[12]For a fuller discussion of recommended initiatives and strategies see *DSM Implementation: Institutional Capability Assessment* (op. cit.) and OECP's Draft *National Strategy for Improving Energy Efficiency in Egypt*, draft, June 1996.

Many organizations whose activities require electricity and thermal energy can significantly reduce their total energy costs with small power systems that provide both electricity (typically 1 to 10 MW) and recover thermal energy from waste heat. In the development of small power systems, individual organizations become producers of electricity and may sell surplus electricity to EEA. EEA effectively would have a new class of customer that at times may produce electricity, and at times may purchase electricity. Barriers to cogeneration exist on both the customer side and the network side.

Component 2 addresses the barriers on the customer side to development of an energy service industry and the to dissemination of information on the benefits and opportunities for efficient utilization of energy. Cogeneration is one of the tools for accomplishing this. Component 3 addresses elimination of the network-side barriers to cogeneration which include both capacity barriers and institutional barriers. Objectives 1, 2, and 4 address the capacity barriers by creation of a well-trained small power group within EEA and creation of the standards, guidelines, promotional and training materials necessary for disseminating information about cogeneration to the Zones, EDCs, and customers. Objective 3 addresses institutional barriers through the creation of the required infrastructure for cogeneration, including the legal framework, tariff for EEA purchase of electricity from small producers, and power purchase agreement.

2. Expected End of Project Situation

The GEF project aims to make significant progress in removing many of the barriers to energy efficiency. The strategy outlined in section 4 reflects a plan to both remove barriers and achieve specific accomplishments along the way that will enable implementation to proceed on a more natural course. Thus there are two aspects regarding "end of project."

The actual end point occurs when project funds are expended in accordance with the proposed schedule, at which point it is anticipated that the first quantifiable reductions in GHG emissions will be observed as a result of reduced losses in the transmission system associated with Component 1 outputs.

Of greater long term significance, however, is that by the end of the project, and in keeping with Operational Programme #5 of the GEF Operational Strategy that emphasizes a long-term impact on greenhouse gas emissions, there will have been developed ongoing and self-sustaining activities designed for achieving energy efficiency and GHG reductions in the future. The purpose of Component 2 and Component 3 is the removal of barriers to such activities. Success in removing the barriers will be translated into subsequent energy efficiency improvements and GHG reductions. The barrier removal will be manifested by:

- a calibration and maintenance facility for transmission system measurement equipment, with supporting training program;

- ongoing and sustained EEA programs to locate and mitigate loss in the transmission system, and to improve generating unit dynamic response;

- use of loss reduction criteria in network dispatch;

- a TOU tariff and installation of TOU meters for direct EEA and EDC large industrial and commercial customers to encourage reductions of the daily peak demand for electricity;

- an Energy Center that promotes energy efficiency and load management to reduce per capita consumption of electricity and other energy resources, and to reduce the peak power demand on the UPS; and is a repository accessible in central Cairo (with possible additional locations within Egypt) for information that supports continued development of an energy services business industry;

- an energy service organization to support industries and commercial establishments in their planning of overall energy utilization, and the design and implementation of small power systems with cogeneration, in order to make more efficient utilization of energy resources;

- two energy efficiency codes that target electrical and thermal energy savings for selected new appliances or equipment;

- an energy efficiency code of practice for the most promising energy efficiency opportunities in new residential and commercial buildings;

- a Small Power Group within EEA to support development of industrial and commercial cogeneration facilities, including the use of agricultural waste fuels, with export of surplus electricity to the grid;

- an infrastructure of the legal framework, tariff, and model power purchase agreements for sale of surplus customer-generated electricity to the grid.

GHG reductions to be achieved at "end of project," as well as after an additional period in which the above activities have been operative, are reported below in section 5.

SECTION B

3. Target Beneficiaries

The target beneficiaries of the project include:

- industrial, commercial, and residential (primarily through the CFL leasing program) energy users who take advantage of energy efficiency information and technical assistance offered through energy audits, the Energy Center, and promotional activities;
- local and international private sector and local NGOs involved in the business of energy services consultation, design, installation, financing, and management;
- owners and occupants of new buildings designed to consume less energy and operate at lower utility costs;
- buyers of new energy efficient equipment that is available in the Egyptian market as a result of voluntary standards and promotion activities; and
- the Government of Egypt along with EEA and EGPC which all benefit from lower investment and expenditures for meeting the reduced energy needs of many of these beneficiaries.

4. Project Strategy and Implementation Arrangements

Project Strategy

The GEF project presents an opportunity for organizations to work cooperatively in accomplishing many of the policy objectives for energy efficiency, and to begin removing barriers to its successful implementation. The strategy for doing so assigns responsibilities for the components, as well as individual objectives within components, to those organizations that have already displayed their interest and capabilities to foster the goal of energy efficiency and reduction of GHGs. Figure 1 displays the 3 components of the project and their primary expected outputs.

Component 1

The objective to reduce transmission losses will be addressed through intensive efforts by EEA staff to acquire the information, knowledge, skills and experience to reduce network losses. The focus of work activities will be to conduct network loss measurements, assess the dynamic response of thermal generation units, and make adjustments in network control and operations procedures. This objective will be achieved through national in-service training, selected use of international expert consultants, and the acquisition and operation of specialized computer control software.

SECTION B

Figure 1
UNDP/GEF Project: Energy Efficiency Improvements and Greenhouse Gas Reduction
Project Components and Objectives

Component 1: Loss Reduction, Load Shifting, and Load Management in the Unified Power System (UPS)	**Component 2: Energy Efficiency Market Support**	**Component 3: Cogenerated Power**
Objectives:	Objectives:	Objectives:
1. Reduce transmission loss of UPS from 7% to 5%.	1. Support and promote the energy service industry through customer awareness, business transformation and capital financing.	1. Establish and train a Small Power Group within EEA.
2. Set priorities for improving dynamic response of all thermal stations.	2. Develop and apply energy efficiency standards for two classes of new equipment.	2. Establish safety and interconnection requirements for parallel grid connections with small producers.
3. Reduce network losses through network analysis and control strategies.	3. Develop and apply a code of practice or standard for energy efficiency in new buildings.	3. Create infrastructure for EEA to purchase electricity from small producers.
4. Introduce a TOU tariff to encourage load shifting.	4. Create an energy efficiency center to promote awareness of and strategic action on energy efficiency within EEA and among energy service industry and energy users.	4. Establish and develop materials for a customer training program.
		5. Develop industrial cogeneration and agricultural waste projects for small power production.

SECTION B

Component 2

This project component is designed to remove barriers to implementation of energy efficiency, and to stimulate a market for energy efficiency investments and related undertakings, such as incubating and supporting energy services businesses. The component strategy addresses policies, capability development, awareness-building, and government regulation to tap more of the economic potential for end-use efficiency, and the associated reduction of GHGs, than is currently being achieved in the country today. The associated strategy relies on three themes:

1) **Policy Stimulus**: changes in policy or procedures that remove a barrier and thus will provide a stimulus for efficiency. Examples include removing the disincentives of high customs duties on imported energy efficient equipment, identifying and fostering incentives for electric distribution companies to promote efficiency and load management, and adopting energy efficiency codes and standards for new equipment and buildings.

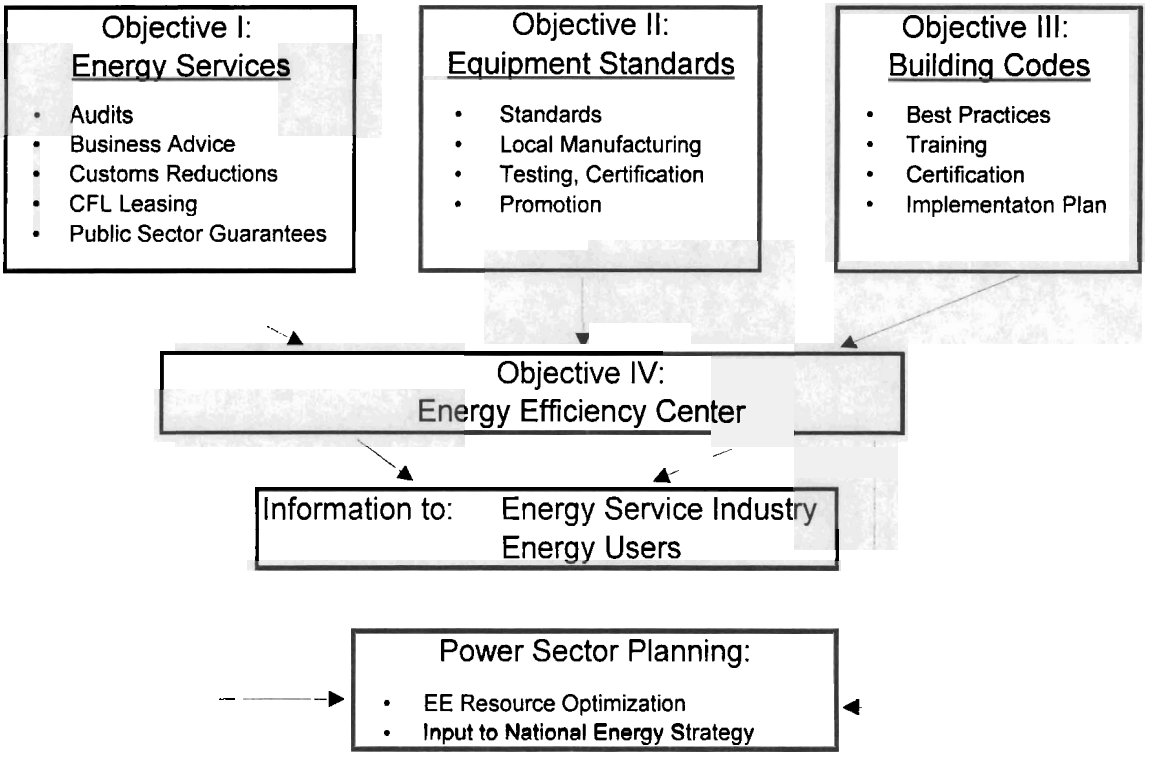
2) **Promotional and educational support for market-based energy efficiency activity by end users**: technical, informational, and financial initiatives that can spur and kindle customer or market demand for efficiency technologies and services, which later can perpetuate themselves in a market environment. Examples include promotion of the benefits of an energy code of practice for new buildings, testing and labeling for energy using equipment and appliances that will enable buyers to make informed energy choices, and packaging a CFL leasing program developed by one EDC for application elsewhere in the country.

3) **Business incubation services:** technical assistance and capability development that can facilitate the development of businesses that deliver energy efficiency technologies and services in a market setting. Examples include customer and market information-sharing, business transformation services, cost-sharing for energy audits supplied by competitive organizations to industrial and commercial facilities, and guarantees for energy management loans to public sector enterprises.

This Component 2 strategy is consistent with the progress of the country's economic reforms, and is well-timed to complement the increase in average energy prices to LRMC levels. This strategy also parallels the changes in power sector restructuring that allow more competition among energy sources and value the concept of customer service. The strategy realistically recognizes that the time has come to nurture isolated cells of energy efficiency capability into larger scale enterprises. Over time, the mix of targets and activities in Egypt's portfolio of energy efficiency objectives and GHG mitigation plans will change to reflect both new opportunities and attention to any lingering barriers.

Figure 2 presents the objectives and expected outputs of Component 2. As is the case in most countries, the strategy combines energy codes and standards for new equipment and buildings with programs to stimulate efficiency improvements in existing industries and

Overview of Component 2: Energy Efficiency Support and Promotion



buildings through voluntary efforts targeted at end users. The specific activities have been coordinated with USAID and its goal to introduce a new umbrella program for the environment during 1998 that will include a component for mobilizing large scale efficiency initiatives that would be carried out through the private sector. Thus the UNDP/GEF project will remove barriers while the USAID project is expected to provide technical assistance in mobilizing large scale implementation. For example the USAID project could fund actual business assistance, market analysis, provide other form of funding to assist private organizations deliver energy efficiency services. Another example would be USAID's ability to fund some implementation cost of building and equipment standards. Examples presented would not be covered through the current UNDP/GEF project.

SECTION B

Component 3

The strategy for this component is to develop the capability within EEA headquarters, the regional zones, and ultimately the EDCs to identify the technical and financial requirements for EEA to interconnect cogeneration units to the UPS, or to facilitate the exchange of cogenerated power between other parties, to the extent permitted by law. This capability will be deployed in three ways. The first is the creation of a defined organizational unit where parties interested in cogeneration can obtain essential information for making design or financial decisions surrounding potential cogeneration facilities. The second is to actively promote cogeneration as a resource when its price, quality, and availability are favorable when compared to alternative resource options called upon by the UPS. The third is to extend the cogeneration knowledge of an initial core group in EEA headquarters to staff in EEA zones and the EDCs.

To accomplish these goals, EEA will create a new staff group called the Small Power Group that will develop the technical capability to promote the development of small cogeneration projects in Egypt. This group will develop expertise required to prepare specifications, contracts, tariffs for interconnection and power sales agreements associated with cogeneration unit connected to the UPS grid. This group will also develop an understanding of the design and financial considerations faced by the cogeneration owner or developer, where this background can be helpful in finding mutually acceptable terms for connection to the UPS. These capabilities will ensure that EEA has the internal capacity to negotiate with industry and private investors on cogeneration arrangements.

Implementation Arrangements

This project will have national execution with full responsibility assigned to the Egyptian Electricity Authority. Responsibility for portions of Component 2 work activities will be assigned to the Organization for Energy Conservation and Planning. As specific needs arise, work assignments will also be made to other entities through sub-contracting arrangements. It is worth noting that other implementation modalities were considered during project formulation. All were rejected because of the strong desire to develop and enhance existing institutional capabilities whenever feasible as the fundamental step in assuring continuity and sustainability of project initiatives after project completion. The project seeks to remove barriers to energy conservation and energy efficiency. The strategy and implementation arrangements are designed to insure that once the barriers are removed, a structure is in place to assure that the anticipated benefits continue to accrue and expand.

From a practical perspective, EEA is an organization that manages a vast and complex enterprise as it performs a critical job throughout Egypt of delivering electricity every

minute of every day, balancing the performance of generating units against the changing demand for power. It is an action agency with direct access to millions of customers. Since most aspects of the proposed project relate to the electric system, the manner in which electricity is utilized, and the manner in which use of electricity and other energy resources can be beneficially combined, the selection of EEA as lead agency is a very effective arrangement, and one which will facilitate achievement of project objectives. EEA shall designate its Deputy Chairman for Planning, Studies and Design to serve as Project Chairman for this project (See organization chart in Annex 1). The Project Chairman is the official representative of the executing agency (EEA), and will ensure essential coordination occurs between the Project Technical Director and both EEA and the High Level Coordinating Council. EEA will contribute the time of the Deputy Chairman at no expense to the Project.

OECP has displayed a unique ability to identify issues regarding energy efficiency opportunities that have traditionally been given insufficient attention, and to initiate activities to bring informed parties together to find technically and politically feasible solutions. Two examples are their initiation of a Green Architecture group to focus attention on energy efficiency in building design, and an initial investigation of issues surrounding possible energy efficiency standards for appliances and equipment. The UNDP/GEF project will build upon this capability by assigning leadership responsibility for Component 2's Objective 2 (Equipment Standards) and Objective 3 (Energy Efficient Design and Construction for New Buildings) to OECP. EEA staff and others will participate in both sets of activities.

Project Functions and Duties

The organization chart for this project is shown in Annex 2.

The goal for the GEF project organization framework is to focus the management of the work activities with a full-time Project Technical Director, with work assignments given to both full-time staff in EEA and OECP, and on a less than full-time basis to other GOE employees, outside organizations, and consultants needed to accomplish the objectives and expected outputs.

High Level Coordinating Committee. This committee will provide overall guidance on the progress of the project work. This committee will be limited in size to no more than five organizations, each represented by a senior officer. Their duties will include review of the annual work plan and budget; selection of the full-time Project Technical Director (PTD); review of work progress at meetings that shall be held no less often than quarterly; and identification of problems and issues that the PTD should address or resolve. This Committee will also contribute to selecting the persons to be represented on the Project Advisory Council. TOR for this committee are located in Annex 2.

Project Technical Director (PTD). The PTD will serve full-time and must have broad experience in energy strategy and mobilization of collaborative efforts. The Project

Technical Director shall be fully committed to the day-to-day tactical management of this project, and will be paid by the project. He or she will manage closely all project work activities and shall be responsible for ensuring that all work remains consistent with project objectives and the project document. The PTD works first for the GEF Council and Project, and secondarily for the EEA Project Chairman. The PTD is expected to make a commitment to lead this project for its full term, approximately four years. The PTD will consult with the High Level Coordinating Committee if it appears significant changes are required in how any work activities are assigned and accomplished.

The PTD will be assisted by an Executive Assistant. Responsibility for certain project management duties will be assigned as follows:

- *Personnel recruitment and assignment to project activities:* The PTD shall be responsible for this, and will seek input and advice from the Project Chairman and OECP Chairman. If needed, the PTD may seek additional recommendations from members of the Project Advisory Council. Once each work group director is chosen, he or she may participate with the PTD in the selection of additional staff and consultant members of the respective work group.

- *Administrative and financial matters:* The Executive Assistant will track and monitor these, with input from EEA and OECP accounting staff regarding expenditures and costs on activities under each of these organizations' immediate supervision. The PTD is responsible for preparation and submission of monthly financial reports to the EEA Project Chairman, and quarterly financial reports to the UNDP project officer.

- *Contracts*: The PTD will prepare and issue all contracts for national consultants and sub-contractor services. In the case of international consultants and trainers, these will be executed by the UN DDSMS. The PTD (in consultation with the relevant work group director) shall participate in developing the short list of all international consultants under consideration, shall finalize the TOR for these assignments, and shall participate in the final decision on each such consultant. The PTD will retain the authority to rescind any contract or agreement with organizations and individual consultants if their performance is not consistent with the TOR and project document.

  Procurement of equipment, supplies, and sub-contract services: The PTD and Executive Assistant will oversee the procurement of all major capital equipment required for the project's activities. Procurement of miscellaneous supplies and sundries may be delegated when other organizations' staff are serving as work group directors, such as OECP or the Building Research Center. The attached list of equipment in Annex form are to serve as guidelines for the PTD. The PTD has the authority to revise this list as is appropriate with implementation requirements.

- *Technical issues:* The PTD has the primary responsibility for the technical approach and quality of all work activities performed on the UNDP/GEF project. However, the PTD is heavily dependent for technical expertise on the work group directors, as discussed below and presented in the Organization Chart in Annex 1. In addition, both the PTD and the work group directors will call upon members of the Project Advisory Council for advice on selected technical and procedural matters.

In addition to the above to specialized assistants will be hired to ensure coordination with (i) local agencies "PTD Assistant Liason to Local Agencies and (ii) UNDESA "PTD Assistant Liason to UN DESA".

TORs for the above positions can be seen in Annex 2.

Project Advisory Council. A Council will be formed from a small number of recognized national experts who can provide periodic short-term technical review, comment, and guidance on project activities, consistent with the project document. These individuals are chosen for their unique expertise, and there should be no substitution with a subordinate or other delegated person. These individuals may perform their work in specialized areas, together or singly, and shall meet as a group at least quarterly. On occasion the Project Advisory Council and the High Level Coordinating Committee may meet jointly. The TOR for this group is located in Annex 2.

Work Groups. Two types of working groups will be formed. For Components 1 and 3, work will be assigned to designated groups of EEA staff. For Component 2, work will be performed through multi-faceted work groups, corresponding to the four objectives of the component. Each working group may consist of a combination of some or all of the following: full-time project staff, part-time assignments filled by other GOE staff, national consultants, and specialized international consultants. In each Work Group, a Work Group Director will be responsible for day-to-day management of activities. This person shall hold a position of responsibility equivalent to a director-level position at EEA and shall be responsible for ensuring the timeliness and quality of the Work Group's outputs and results.

The expected membership or composition of each of these project implementation groups is described below. National consultants will provide expert assistance in specific technical areas and will participate in training programs. International consultants in very specialized areas, and with unique access to technical programs and capabilities in energy efficiency and cogeneration elsewhere in the world, will provide guidance and participate in training.

SECTION B

The Project office shall be located in a centrally located area of Cairo. Such a central location is critical to the success of this project, which depends upon close communication among a diverse group of organizations and specialists that will be coordinating activities on this project.

Composition and Qualifications of the Project Implementation Organizations:

High Level Coordinating Committee: should comprise five primary organizations, each represented by the following suggested senior level official or other high level designated representative:

Minister of Electricity & Energy - First Under Secretary
EEA:
Chairman; Deputy Chairman for Planning, Studies and Design; Deputy Chairman for Operation
UNDP - Cairo Resident Representative or Deputy Resident Representative
EEAA - Chief Executive Officer/ Executive Chairman
OECP - Chairman
Business Sector - Chairman - Alexandria Electricity Distribution Company

The GEF Project Technical Director will attend as rapporteur.
Each organization shall be responsible for the salaries of individuals participating in the High Level Coordinating Committee.

Project Management Organization

Project Chairman (the EEA Deputy Chairman for Planning, Studies & Design)

- **Project Technical Director** (PTD)
  Supported by a project assistant for coordination, including assistance with national execution of contracts, procurement, administration and financial, and coordination with UN DDSMS on their management support activities

- **UN DDSMS**
  This group will execute all contracts for international consultants, study tours, and training contracts involving international instructors. UN DDSMS will share and consult with the PTD, UNDP/Cairo, and UNDP GEF/RBAS proposed short lists of international consultants. The PTD (in consultation with the relevant work group director) shall contribute suggestions for the short list of all international consultants, draft the TOR for these assignments, and participate in the final decision on each such consultant.

- **Project Advisory Council**
  A project council of senior advisors will be identified to advise the PTD on issues that may arise during the course of the work. These advisors should be appointed by the PTD and the Coordinating Committee and might include such recognized individuals as Prof. Osama A. El-Kholy of EEAA, Dr. Emad El-Sharkawi for the Ministry of Electricity, Dr. Mohamed M. Awad of EEA, Dr. Ahmad Amin of TIMS, Dr. Mohamed S. El Sobki (Jr.)of Cairo University, Mr. Adel El-Danaf (Chairman of the ECEP Steering Committee and of the Metallurgical Holding Company), and Dr. Adel El Mouzy of the Chemical Holding Company. In addition, additional advisors may be named to represent such subject areas as industry, agricultural cogeneration, consumers, Electric Distribution Company chairmen (such as Chairman Ahmed Mostafa El Mofti of Alexandria EDC), and the housing sector.

Work Groups

The following work groups are examples of how the work may be structured. Details may change as exact staff and consultant appointment decisions are made. Some members will be GOE staff for whom a supplemental pay incentive has been budgeted. Non-GOE staff will be retained as part-time national consultants. A list of the specific positions in each of these categories is presented in Section E.

1. Transmission
Director: Director for Loss Reduction
Members: All EEA staff: Equivalent of full time for 2 instrumentation engineers, 2 network analysts, 1 control engineer, and part-time from 1 operations engineer, 4 plant operators, and 2 administrative support staff. Training engineers will also participate.

2. Load Shifting
Director: Director for Load Shifting
Members: part-time assignments for 2 tariff/financial analysts

3. Energy Efficiency Market Support

A. End Use Efficiency Promotion and Support
Sub-group on Audits and Technical Services
Director: Director, Auditing and Technical Services
Members (within EEA): Executive Assistant, Seminar Planning Specialist, Economists, Auditors,
Members (Outside Consultants): Egyptian and international firms specializing in audits, business, finance, and the energy service industry

Sub-group on Business & Finance
Director: Director, Business and Finance
Members (within EEA): Financing Specialist, Executive Assistant
Members (Outside Consultants): Egyptian and international firms specializing in energy efficiency finance

B. Equipment Standards
(See detailed discussion of work groups and sub-committees in Section D, Component 2, Objective 2. regarding work activity participants)
Director: Energy Efficient Equipment Manager (OECP)
Members: A select group of part-time staff drawn from OECP engineers, EEA engineers, Egyptian Organization for Standards, Egyptian Chapter of International Electro-technical Committee, and one or more staff of Egyptian testing and certification organizations
Additional personnel resources: Representative of the Engineering Syndicate, national consultants in electrical and thermal engineering from universities and technical institutes; consumer protection representatives (for example, the Society for Consumer Protection, or the consumer NGO in Alexandria.

C. Building Design and Construction Codes
(See detailed discussion of work groups and sub-committees in Section D, Component 2, Objective 3 regarding work activity participants)
Director: Energy Efficient Building Manager (OECP)
Members: senior staff research professor from the Building Research Center (BRC) of the Ministry of Housing and Construction, assisted by other BRC staff
Additional personnel resources: selected private sector consultants and university professors from faculties of architecture, engineering, or design; staff from NREA with experience from implementation of solar water heating regulation.

D. Information and Promotion Center
Director (EEA): Director, Information and Promotion
Members (EEA): Integrated Resource Planning Expert; economists and engineers with experience in technical information collection, assessment, and transfer, and in electricity system resource planning; transfer of information from members of Business and Finance and Auditing and Technical Services.
Members (Outside EEA): Firms specializing in information dissemination and public and media relations; business and energy service industry consultants; international integrated resource planning experts; OECP staff to advise on the transfer of information on equipment standards and building codes.
Additional personnel resources: consultation with OECP's media and outreach staff, and support from a marketing and public relations firm.

4. Cogeneration
This work group will require the creation of a new EEA group for Small Power.

Director: Director, Small Power (a new position to be created)
Members: 5 full time staff including electrical engineer, instrumentation and control engineer, 2 mechanical engineers, and one financial specialist; part-time staff work from a tariff/financial analyst, legal analyst, and safety engineer; additional part-time administrative support staff.
Additional personnel resources: 2 national consultants -- one a cogeneration system engineer, and the other an agricultural engineer.

Project Inception Activity

After the project has been approved and the project assignment is formally dedicated, the project's activities will be initiated by a project inception process that shall be comprised of an initial meeting, a detailed work plan, preparation of TORs for the work groups, and a formal Project Inception Workshop. During this period, a small group of individuals shall be designated from EEA, OECP, UNDP, and other groups to work with the PTD to review the project document and prepare more detailed work plans, schedules, and assignments for each project activity spelled out in the project document. Near the beginning of this work, the work plan group may elect to meet with one or more of the international consultants who prepared the project document to elaborate upon specific details and issues related to project work activities.

Following the preparation of detailed work plans, there will be a 2-3 day Project Inception Workshop to formally execute and announce this project and its planned activities to interested organizations and professionals. The project inception process shall be initiated by the PTD through a meeting of key stakeholders in the project, during which the Project Document and detailed work plans shall be presented. This meeting will represent an opportunity to publicize this project to stakeholders and will also allow for the immediate contributions from knowledgeable individuals in the private and public sectors regarding their specific expertise, sources of needed information for project activities, and updates on recent developments relevant to the project.

5. Reasons for GEF Assistance

The project is developed in line with Operational Programme #5 of the GEF Operational Strategy for Climate Change: Removing barriers to energy efficiency and energy conservation. It will be the forerunner for World Bank power sector work and as such will assist with the establishment of the enabling environment which will successfully facilitate the follow-on World Bank investments.

The project funds are devoted to removal of barriers as a mechanism for institutional strengthening and capacity building within the Ministry of Electricity and Energy, specifically addressing the needs for restructuring, greater efficiency, self-sustainability, and appropriate technologies within the EEA. The project is crucial as a facilitating and

catalytic step for effective reorganization and efficient operation within the electricity sector. the project also targets energy efficiency in the industrial sector, which will produce both electric benefits and thermal (direct use of primary energy such as oil and gas) benefits from improvement in combustion efficiencies and reduction of associated pollutants.

The energy sector is not without other donor activity, some of which is exceedingly well-funded and broadly directed toward similar objectives. Even in this environment, the UNDP assistance provides a key link toward the ultimate transfer, replication, and widespread use and application of energy technology by dealing specifically with the institutional barriers. In this nationally executed project, a level of continuity and project sustainability is provided that is absent in other donor programs.

UNDP assistance is also necessary for this project because of the valuable focus it brings on balancing the conflicts between development and environment, and in encouraging through more effective communications, as well as incremental funding, a truly global perspective with respect to climate change issues.

Anticipated Greenhouse Gas Reductions

The proposed GEF project will produce significant GHG reductions. As discussed below in Table 1, the proposed GEF project is expected to reduce energy consumption by a total of 4.2 million tons of oil equivalent (MMTOE)/year by the year 2010. These energy savings represent 11.8% of Egypt's total estimated energy use and are equivalent to 11.7 million tons of CO_2 per year.

The GHG reduction benefit of each component is positively correlated with the level of GEF funding sought. Component 2, the largest component in the proposed GEF project is expected to provide 8.25 million tons of CO_2 reductions and represents the largest share of the project's GHG reductions. Component 3 provides an additional reduction of 3.0 million tons of CO_2. Component 1, for which no GEF funding is being used provides 0.48 million tons of CO_2 reductions per year. The assumptions and methodology used to derive these estimates are presented in Annex 7.

SECTION B

Table 1
Estimate of Total Energy Savings and CO_2 Reductions
(Annual Savings by 2010)

		Energy Savings		
		Total	% Total Energy	CO_2 Reductions
Component	Objective	(MMTOE)	Consumption[13]	(MM Tons)[14]
	I:	**0.17**	**0.5**	**0.48**
	II: 1	1.37	3.8	3.77
	2	1.24	3.4	3.40
	3	0.34	1.1	1.08
	4[15]	N/A	N/A	NA
Total II:		**2.95**	**8.3**	**8.25**
	III:	**1.08**	**3.0**	**3.00**
Total, All Components:		**4.20**	**11.8**	**11.73**

6. Special Considerations

Two features of this project formulation are particularly noteworthy. One is the objective to target efficiency from the use of all fuels, both electric and thermal. This will be achieved in Component 2 through energy audits that address all fuels, support of energy services business that targets all fuels, and the selection from both thermal and electric possibilities of appropriate equipment to receive energy efficiency standards. It will also be achieved in Component 3 through cogeneration which draws upon petroleum, gas or agricultural fuels to produce heat and power at far greater efficiency than traditional large power generation stations.

The second feature is the focus of the project on stimulating efficiency investments and implementation by and through the private sector. This will take place in Component 2 through energy audits and energy service companies; the participation of equipment manufacturers in standards development; and the involvement of building owners, designers, and builders in the building codes work. In Component 3, both public and private enterprises will be able to propose cogeneration projects, and negotiate terms of connection and power sales with EEA.

[13]Relative to current total energy consumption of 36 MMTOE

[14]Based on a mix of 73% natural gas and 27% mazout in electricity generation.

[15]Not assumed to create energy efficiency and CO_2 reductions independently. Rather, this objective facilitates the overall achievement of efficiency and GHG reduction goals in Objectives 1-3 of Component II.

SECTION B

7. Coordination Arrangements

A number of coordination arrangements will be critical to the success of this project. Over the course of the work activities, the project must establish effective coordination with both national and international activities.

National Coordination

In conjunction with the energy efficiency services industry activities to be conducted in Component 2, coordination will occur with the energy service activities underway and planned by the Alexandria EDC, including its CFL program, energy audits, and power factor correction service programs. As an example of possible coordination, the current chairman of AEDC, Eng. Ahmed M. El Mofti, has been suggested as a possible member of the Project Advisory Council for this GEF project.

Coordination is required between EEA's power resource planning staff and the Load management work group of Component 1, information and promotion work group of Component 2, and the Small Power work group for Component 3 as they all review the results of the UNDP/GEF project activities, and integrate this information into EEA's power planning activities. Part-time work of an EEA integrated resource planning staff member is planned for Component 2 to facilitate this coordination. EEA staff are performing the work of Components 1 and 3, and will contribute their findings to EEA's planning activities through the PTD and the Project Chairman (EEA's Deputy Chairman of Planning, Studies and Design) who has responsibility for EEA's resource planning.

The EEA work groups for Components 1 and 3, and the information and promotion work group for Component 2 will also package their findings for delivery to both EEA and OECP for consideration in updates of the National Energy Strategy.

The information and promotion work group for Component 2, and the Small Power work group for Component 3 will package their findings for use by OECP in preparing and updating Egypt's National Action Plan for Climate Change.

International Coordination

The most important coordination will occur through discussion of the UNDP/GEF project at the semi-annual Donors Committee Meetings for assistance to the Government of Egypt. IT was through this forum that USAID was informed of the current configuration of the UNDP/GEF project early in 1997.

Detailed coordination has already begun between USAID's concluding ECEP project, and plans for of a new Environment Policy project anticipated to begin in 1998, via meetings held in Cairo during the original development of the project brief, and again in

May 1997 for the formulation of the project document. This coordination will continue through invitation of AID to participate in the Project Appraisal Committee, and participation in the GEF project of local organizations that are implementing the AID ECEP work. Although the future AID Environment Project has not yet been designed, it is anticipated that work activities will relate primarily to Components 2 and 3 of the UNDP/GEF project, and that organizations such as EEA and OECP will participate in both projects.

Coordination will also be vital between the UNDP/GEF project and the continuing research and pilot activities undertaken by the European Community's OME in its Mediterranean technical assistance project to Egyptian cities such as Alexandria. It is anticipated that areas for coordination will relate to Component 2's Objectives 1 and 4. OECP, EEA, and AEDC all are current participants in this project. The fact that their Chairmen and Deputy Chairmen will participate in both projects can assure that the involved staff coordinate all necessary activities.

Additional regional cooperation is anticipated with the UNDP/GEF projects taking place in the Palestinian Territory and Syria, particularly on efficiency improvements to the transmission and distribution systems, and development activities for supporting the energy services industry and promotion of awareness of the benefits of energy efficiency, financing mechanisms for efficiency improvements. Additional coordination can occur with the OME's activities in selected cities around the Mediterranean region, including Tunisia, Israel, and Palestinian Territories. The best mechanisms to achieve effective coordination will be to:

- compile a contact list of key individuals and organizations from other countries in the region, drawing upon suggestions of UNDP/GEF RBAS, EU's OME, OECP, and the Building Research Center
  use the contact list to invite interested countries to send a representative to the Project Initiation Workshop, and annual project review meetings

- send notices of Egypt's UNDP/GEF training activities and workshops to the contact list, inviting their participation on subjects directly relevant to their energy efficiency activities

It is the responsibility of the Project Chairman and Project Technical Director to assure that all this coordination occurs. They can be assisted by the Project Advisory Council members who can help assure that coordination is most effective. It will also be important that the Energy Efficiency Center established under Component 2, Objective 4 develop effective methods for information dissemination and professional exchange within Egypt and the neighboring region.

SECTION B

8. Counterpart Support Capacity

The Ministry of Electricity and Energy has expressed its full commitment to sponsor the objectives and outputs of this GEF project and to continue with their full implementation beyond the project completion date. EEA has expressed its willingness to execute the project, and to do so in collaboration with other local organizations, including OECP, the Egyptian Organization for Standards, the Ministry of Housing and Construction, and the electric distribution companies.

To facilitate the administration of arrangements to secure international consultants, international study tours, and international instructors for training programs held in Egypt, the Ministry of Electricity and EEA have agreed to an arrangement for supporting services from the UN DDSMS unit in New York. It is the expectation of EEA that it and other local organizations will continue to exercise leadership in preparation of specific terms of reference for these resources, and the selection of international experts. At the same time, EEA welcomes the administrative facility offered by DDSMS to ensure these resources are obtained in an expeditious manner and at the most favorable cost for the quality of experts desired.

9. Detailed Strategies for the Components and Their Operational Objectives

Component 1

Strategy

The detailed strategy for this component (which was identified briefly in Section 4) is to systematically reduce the barriers in every aspect of network management and control which can have a beneficial impact efficiency improvement and GHG reduction. Accordingly, the strategy incorporates the following steps: (1) improve the accuracy and the capability for network loss measurements; (2) improve network power factor and voltage regulation by installation of appropriate compensation devices at selected points within the network; (3) improve the dynamic response capability of thermal power stations such that transmission distances for load following capacity to meet demand swings can be reduced, thus reducing transmission losses; (4) encourage a reduction in peak demand with a new time-of-use tariff reducing the requirement for less efficient reserve generating capacity and making the daily demand curve less variable; and (5) embed within the unified power system control philosophy the principles necessary for dispatching and controlling the network for minimum loss and minimum environmental impact.

The operational objective at completion of the project is to have in place within EEA tested and established procedures for loss measurement, and network management and control strategies for the UPS, that are maintained by a competent and responsible staff organization whose performance is assured and continually refreshed through an established training program.

The detailed operational objectives for network management and control encompass programs that will be in routine usage for power factor correction, voltage regulation, and thermal station dynamic response, as well as for extending implementation and acceptance of time-of-use tariffs.

Component 2

Objective 1: Energy Services Industry Support

EEA has committed to establish a customer service strategy and organization as part of its future services in delivering power to its direct service, high-voltage customers and to its electric distribution companies[16]. EEA and other entities in Egypt are developing customer service activities for both EEA direct-service and electricity distribution companies, including: providing information on major energy efficiency technologies, performing power factor correction, and facilitating cogeneration, and using resource staff to respond to customer inquiries on energy use issues. The following section describes the activities that are relevant to each of the five outputs of Objective 1 under Component 2.

Output 1: Audits. Prior studies have shown that there is substantial energy savings potential in Egypt, mostly in the country's industrial sector. While individual consumers are gaining increasing knowledge of their energy savings potential[17], a lack of awareness of energy savings among private and public sector decision makers remains a significant barrier to greater energy efficiency. EEA can make a significant contribution towards reducing these barriers.

Current Situation: Consumer Awareness of Savings

Egypt has the potential to save 2.5-6.6 MMTOE per year of energy through energy efficiency measures with a payback period of three years of less, according to a 1994 macro-level study of the energy sector conducted by USAID. (See Table 2.) This annual savings potential is equivalent to a reduction of 6-17 million tons

[16]It should be noted that the distinction between EEA direct service customers and customers served by EDCs is not fully clarified. This issue must be fully addressed and clarified during the project inception period.

[17](e.g., the experience of Alexandria Electricity Distribution Company's pilot compact fluorescent program showed savings of 25%

of CO_2. Potential savings in industrial thermal consumption account for slightly more than half of these potential savings.

Table 2
Fossil Fuel Energy Savings Potential by Sector

Sector	Savings Potential (MMTOE)		% of Total Potential Savings	
	Low	High	Low	High
Electricity	0.8	2.2	32	33
Industrial Thermal	1.4	3.3	56	50
Residential Thermal	0.3	1.1	12	17
Total Savings Potential	2.5	6.6	100	100
Total Savings as % of Total Energy Use	7%	18%	---	---
CO2 Equivalent	6.0	17.0	---	---

Source: USAID, *Assessment of Demand-Side Management Potential In Egypt*, December 1994

Consumers are increasingly aware of the potential for energy savings. Organizations such as the Energy Conservation and Environmental Project (ECEP) have performed dozens of facility audits during the last 2-3 years. These audits largely confirm the findings of USAID'S macro-level studies. For example, recently completed audits performed under ECEP's DSM pilot project of 13 large industrial facilities showed that facilities could save 5-20% of their electricity just by undertaking low cost measures such as process control improvements and steam trap maintenance. Groups such the Tabbin Institute of Metallurgical Research and DRTPC are building upon expertise gained through donor funding and expect to perform audits on a commercial basis in the coming year.

Barriers

Despite the contributions of these groups, a lack of awareness of potential energy savings continues to be a barrier to greater energy savings in Egypt. With GEF assistance, EEA can help address three types of audit-related initiatives, thereby removing barriers to customer awareness, and generating additional energy efficiency improvements. First, facility decision makers need to be more aware of potential energy savings.

Second, energy audits can better utilize expertise of such organizations as EEA, which have expertise in such areas as interior electrical network improvements. The recently completed ECEP pilot DSM project did involve EEA. ECEP directors referred to the enlistment of support from groups that previously were not closely involved with audits (such as EEA) as one of the DSM pilot project's notable achievements. However, to build upon the success of the ECEP program, groups like EEA need to be more involved on a more permanent basis.

Third, several groups have argued that audits need to focus more attention upon "horizontal" integration within technologies rather than "vertical" expansion within a facility. That is, a large number of energy audits could evaluate savings in one or a few particular technologies or industrial processes rather than evaluating all sources of energy savings at a single facility. The recently completed DSM pilot project focused only upon low-cost measures.

Strategy

GEF assistance under this program will help EEA to overcome these barriers by providing for:

- executive level audit reports specifically designed to increase energy savings awareness among decision makers
- an established presence for EEA in promoting audits and energy savings awareness,
- EEA electrical expertise to perform audits in process control improvements and to contract for steam trap or other thermal savings audits among its direct service customers.

Output 2: Business Transformation. An energy services industry is only beginning to emerge in Egypt.

Current Situation

Two academic technical organizations (TIMS and DRTPC) have begun performing audits, facility retrofits, monitoring and verification, and other services through support from ECEP. Within a year, these groups will begin providing these services on a commercial basis. Other academic groups are also providing energy efficiency services. Only a few private companies such as SEGA are providing energy services. No organization is providing services under "performance contracts" under which an Energy Service Company (ESCO)

guarantees energy savings and agrees to be paid from a facility's verified energy savings.
ECEP has provided seminars, study tours, and other business advisory services to organizations providing energy efficiency services. Work to date has exposed Egypt's energy service industry to the concept of performance contracting and has provided the energy service industry exposure to ESCO practices, particularly in the U.S.

Persistent Business Barriers

Energy service industry business issues remains a key barrier to greater energy efficiency in Egypt. Continued work needs to build upon ECEP's contributions in two key areas.

First, as the energy service industry continues to emerge in Egypt, an entirely new group of market participants will emerge. The most widely recognized energy service industry participants are currently affiliated with academic institutions, according to a recent ECEP survey. Private companies specializing in equipment distribution and installation such as SEGA account for only a small percentage of energy services. Equipment manufacturers have yet to make any measurable impacts on the energy services industry. These expected new participants have not received exposure to the training and exposure to business issues that have been provided by previous donor efforts.

To succeed in business and make a measurable impact on energy efficiency in Egypt, these new market entrants will need to know how to transform their current businesses in equipment manufacturing, construction contracting, electrical engineering, equipment, installation, or facility maintenance into companies that provide more comprehensive services. Companies acquainted with basic energy service concepts will be better able to provide more comprehensive energy services and thereby achieve higher levels of efficiency for their customers. The business advisory services provided by EEA through GEF assistance in this program will provide such information to these new market entrants.

Second, the level and complexity of business advisory services provided to Egypt's energy services industry needs to "grow with the market". In today's environment in which performance contracting is non-existent. Few private companies are seriously pursuing energy efficiency businesses. Even companies that are currently active in the energy service industry have had no reason to focus on many contracting, business strategy, and customer relations issues that are only relevant to true ESCO industries. The energy service industry will only begin to consider these issues within the next few years, after the ECEP program has

expired.[18] The industry needs new training and business advisory programs in order to succeed and help Egypt achieve the potential 7-18% efficiency improvements shown in Exhibit 2.

Project Strategy

GEF assistance under this program will help EEA to facilitate and provide the business advisory services needed in a growing market by providing training to new market participants on increasingly complex issues. The transition from business advisory services provided under ECEP and those provided under this EEA-executed program needs to be managed carefully. EEA officials need to participate in business advisory seminars provided during the last year of the ECEP program. EEA needs to enlist support and cooperation from ECEP for business seminars conducting during its initial year of this GEF-funded program.

Output 3: Customs-Related Barrier. Work under the ECEP and other programs has shown that a lack of energy efficiency equipment is a barrier to greater energy efficiency in Egypt. This program will help address this barrier.

Barrier

Egypt currently produces little or no energy efficient equipment. For at least the next several years then, achieving higher levels of efficiency will require that most equipment be imported. However, energy efficient equipment can currently face import custom duties of as much as 55%[19]. Technically, energy efficient equipment should not face such high custom duties. The Minster of Finance has the right to reduce duties on equipment and supplies whose value is 100,000 LE or less. Under proper classification, most energy efficiency equipment could receive lower custom duty rates that may be as low as 5%. Most energy efficient equipment is not, however, properly classified for the purposes of custom duties and therefore must pay the higher rate of 30-45% that is charged to most equipment. Legislation to reduce custom duties would be helpful, but may not be necessary.

These high custom duties pose barriers to energy efficiency in two ways. First, high custom duties often make it uneconomic to use imported energy efficient equipment or at least make energy efficiency a substantially less attractive option

[18]ECEP is due to expire in September 1998.

[19]Allied Business Consultants, *Business Evaluation of the ESCO Approach and Energy Savings Performance Contracting In Egypt*, page 7-8

than it would otherwise be. Second, the existence of high custom duties on imported, energy efficient equipment shields Egyptian equipment manufacturers from competition. Until this protection is lifted, it is likely that little or no energy efficient equipment will be produced in Egypt.

The threat to energy efficiency posed by this improper customs duty classification of equipment has only recently begun to gain attention. Prominent organizations such as EEA have not formally opposed such reclassification. However, they have not worked actively for custom duty reclassification.

Project Strategy

The contribution of prominent groups such as EEA and OECP in actively lobbying for change in this area can have a powerful impact on Egyptian policy makers. GEF assistance will help EEA to provide evidence of the benefits of custom duty reform in terms of a higher level of energy efficiency and greater oil exports. Backed by this evidence, EEA and OECP can bring about real and powerful change in this area.

Output 4: Residential Compact Fluorescent Lighting Program. More efficient residential sector lighting can reduce CO_2 emissions, reduce peak electricity generating capacity needs, and improve electricity distribution companies' profitability. The participation of EEA in advocating and disseminating a compact fluorescent lighting program can help remove barriers that are preventing greater residential lighting efficiency.

Current Situation

There are clear and compelling reasons for EEA, electricity distribution companies, and others to pursue more efficient lighting in the residential sector. Lighting represents one of the most important electricity end-uses in the residential sector. Nearly all of the lights used in Egypt's residential sector are low efficiency incandescent lights. Use of this lighting occurs mostly during the evening hours and is largely responsible for EEA's peak time electricity production. Most of the generation used during these peak periods is inefficient oil-fired units. Electricity distribution companies (EDCs) would benefit greatly from lower energy use in the residential sector, because nearly all residential customers pay subsidized rates of about 8 piastres/kWh, causing the EDCs to lose more than 3 piastres/kWh for every kWh purchased from EEA.[20]

[20] EDCs lose more than 3 piastres/kWh, because they have to pay EEA about 5 piastres/kWh for electricity purchases from EEA and must incur additional costs for electricity distribution.

The Alexandria EDC (AEDC) has already developed and designed a program to begin addressing this issue: a compact fluorescent light (CFL) leasing program. Under this program, AEDC would buy CFLs and lease them back to their customers, collecting lease payments through their electricity bills. Compared to normal 100 Watt incandescent bulbs, CFLs distributed under this program would use 20 Watts or only one-fifth the amount of energy, while delivering a comparable amount of light. This program would utilize the 1995 leasing law that has been previously unused for energy efficient equipment.[21] AEDC is prepared to launch this program pending a reduction in custom duties for CFLs. In a pilot effort where the lamps were distributed at no cost, peak electricity use was reduced by 25%.

Barriers to CFL Program

Residential customers are unlikely to begin using CFLs on their own, without an effective leasing program such as developed by AEDC. CFLs have an initial cost per unit that is 20 times greater than ordinary incandescent bulbs.[22] Customers are unwilling to undertake this expense in light of most customers' limited financial resources and the subsidized electricity rates they currently pay. However, under a leasing program, customers would realize immediate savings in their electricity bills, even under current rates.

The benefits of AEDC's program are unlikely to be realized outside of this service territory without dedicated and concerted efforts to replicate this program throughout Egypt. The new and largely untested leasing law represents a considerable uncertainty that must be faced. The leasing law that was just passed in 1995 has not yet been used to lease energy efficiency equipment. Compared to AEDC, many EDCs serve a different mix of customers and have different levels of expertise[23]. They therefore face challenges different from those faced by AEDC. GEF assistance will help EEA to overcome these barriers.

Project Strategy

Under this program, EEA will design and establish a centralized and generalized program to promote a CFL lighting programs among other EDCs. Technical

[21]Source: USAID/ECEP. *Financial Issues for Energy Savings Performance Contracting Study,* March 1997, Chapter 3.5, prepared by TIIA.

[22]Compared to incandescent lights, CFLs have a useful life that is up to 8 times longer and uses 80% less energy.

[23]AEDC serves a customer base that is largely urban and has benefited from training and experience under the European Union-funded, OME Program.

advice on the areas of leasing and program implementation would further reduce uncertainties for implementation by other EDCs.

Output 5: Loan Guarantee Program for Partially Privatized Companies. There are considerable barriers to energy efficiency financing in Egypt. Public sector enterprises and partially privatized entities in particular have little access to medium- to long-term capital at reasonable rates.

Current Situation

A large portion of Egypt's estimated 2.5-6.6 MMTOE energy savings potential lies in the public sector. In the industrial sector, where a majority of the county's energy savings potential lies, the public sector accounts for 70% of total energy use. Industrial and other facilities in the public sector tend to be older, less well-maintained, and hence less efficient than in the private sector. While public sector companies state they are both more willing to consider energy efficiency investments than in the private sector,[24] the lack of a "corporate bottom-line" has historically made public sector enterprises less motivated to make these investments.

Financing Barriers

In attempting to finance needed energy efficiency investment, public sector companies face many of the same barriers as private companies. Most importantly, Egyptian banks are often reluctant to consider energy efficiency loans because the energy service industries that are making efficiency improvement are unwilling or unable to guarantee savings through performance contracts. Energy service providers tend to be too small, too poorly capitalized, or too inexperienced to provide credible guarantees. An additional barrier is the lack of domestic bank experience in making medium and long-term loans. Bank Misr is the only public commercial bank that lends money for periods of more than a year. Finally, lending terms can be difficult. For example, the current domestic interest rate is about 14%.

Public sector companies and many partially private companies face an additional barrier in terms of available financing sources. Donor funded programs are becoming increasingly available in Egypt. Donor agencies have more experience in medium- and long-term lending; donor funds typically have interest rates that are lower by about 5 percentage points. However, none of these funds is available to any firm whose ownership is more than 25% public.[25] Even the recent trend

[24]Source: USAID/ECEP *Market Assessment for Energy Efficiency and Environmental Protection Services in Egypt*, March 31, 1997

[25]Source: USAID/ECEP, *Financial Issues for Energy Savings Performance Contracting Study*, March 1997, Chapter 3 prepared by TIIA.

towards privatization will not help most public sector companies gain greater access to low-cost and experienced funding sources, as the majority of planned privatization will lead to only partial private ownership. Most private companies will still have more than 50% public ownership.[26]

Actions planned for the next year under ECEP and other initiatives will be unlikely to resolve these financing barriers. Much of the planned activity will be to increase the commitment of donor agencies to provide dedicated funding for energy efficiency in the private sector and to design project financing mechanisms that will primarily be applicable to private companies.

ECEP will undertake one initiative that has the potential to assist public sector enterprises in the long term, i.e., the design of guarantee and other facilities that will provide greater certainty for performance based contracts. The eventual contributions of work in this area are uncertain. In the near term, the private beneficiaries of these efforts will likely be private firms. This work may, however, provide a basis upon which an EEA initiative supported by UNDP may be able to build.

Project Strategy

Through this GEF-funded program, EEA can help address unmet financing needs of the public sector by providing a source of partial guarantees that will be available for loans to partially privatized entities.

Objective 2: Equipment Codes

Many types of energy-using appliances and equipment used in Egypt offer the potential for significant increases in energy efficiency for future new models. By way of example, it is worth looking at the U.S. experience by comparing new equipment in 1972 (prior to the adoption of any energy standards) to a series of national and state standards that were adopted through 1995. This reveals significant improvements in energy efficiency for new gas heaters (25%), air conditioners (30-35%), and refrigerators (60%).[27] Around the world both mandatory and voluntary standards programs to improve efficiencies have targeted other new equipment such as motors, lighting and computers.

[26]Source: May 1997 Egyptian government press release announcing pending privatizations

[27]Steven Nadel and David Goldstein, *Appliance and Equipment Efficiency Standards: History, Impacts, Current Status, and Future Directions*, American Council for an Energy-Efficient Economy and Natural Resources Defense Council, June 1996.

SECTION B

Current Situation for Egyptian Appliance and Equipment Energy Use[28]

As shown in the following tables, the industrial and residential sectors account for most of the electricity consumption and non-transport oil and gas use in Egypt. Lighting is a significant electrical use across all three sectors, refrigerators are a significant use among residential and commercial users, and motors are the primary electrical end use in industry. Most oil and gas use is in the industrial sector, using about 70% of the non-transport oil and gas, with the remaining 30% split between residential and commercial users combined. Industrial oil and gas use is concentrated on a variety of heating process, encompassing drying, heating of materials and fluids, melting, and process steam.

[28]Overseas Bechtel and RCG/Hagler Bailly, Inc., *Assessment of Demand-Side Management (DSM) Potential in Egypt*, for USAID, December 1994.

SECTION B

Sectoral Energy Balance for Egypt

Sector	Percentage of National Electric Use (1992/93)	Percentage of National Oil/Gas Use (1989/90)
Industry	43	48
Residential	33	18**
Non-residential Lighting*	5	--
Agriculture	4	1
Government*	5	**
Public Utilities*	7	**
Transportation		32
Other*	4	**
TOTAL	100	99

* These largely comprise the "commercial" sector, though some public utilities may be industrial in nature, and some government facilities may be residential in nature.

** These categories are combined for oil and gas energy. Data are for the most recent year contained in documents available to the project preparation team.

End Use Shares of Electrical Consumption, by Sector

End Use	Estimated Share of Electric End Use		
	Residential*	Commercial	Industrial
Lighting	28-30%	31-40%	1-20
Cooking	unknown	1%	
Water Heating	3-10%	3-9%	
Space Heating	1%	not available	
Cooling -- A/C -- Fans	0-1% ?? 1-6%	41%	
Refrigerators or refrigeration	19-40%	7-8%	
Entertainment	12-15%	--	
Iron	5-9%		
Washer	4-16%	--	
Elevators		2%	
Water pumps		1%	
Motor Drives			60-95%
Heat			0-40
Electrolytics			0-40
Other	3-30%	14-18%	

* Typical end use shares of electricity for three residential communities (Manshiet El-Bakkary, Mersa Matrouh, Alexandria) since there is no comparable national data

SECTION B

End Use Shares of Oil & Gas Consumption, by Sector

End Use	Estimated Share of Oil/Gas End Use		
	Residential*	Commercial	Industrial**
Lighting	0-22%		--
Cooking	62-81%	Most all use is for cooking	--
Water Heating	19-30%		--
Space Heating	unknown		3
Baking, drying, curing			17
Heating			13
Fluid heating			17
Melting			5
Process Steam			25
Cogeneration			10
Feedstock			10

* Typical end use shares of electricity for three residential communities (Manshiet El-Bakkary, Mersa Matrouh, Alexandria) since there is no comparable national data

** Data are taken from report on DSM potential in Egypt, but using U.S. data as a proxy since there was no Egyptian end use data for industrial oil and gas use.

Most residential appliances; commercial lighting, air conditioning and refrigeration equipment; and industrial electrical and heating equipment is manufactured locally. Imported equipment tends to include controls technology, high-end consumer appliances, and industrial refractories, heat recovery systems, and cogeneration equipment. Very little high efficiency equipment is available in the market, whether locally manufactured or imported. Import duties on technologies (including much of the high efficiency equipment) may be as high as 30-70%. [29]

Barriers to Purchase of High Efficiency Equipment

The most significant barriers to consumers demanding and purchasing energy efficient appliances and equipment are 1) lack of consumer awareness that better designs are possible, 2) limited competition in Egypt among manufacturers of major equipment lines that might encourage innovation in designs, 3) historically

[29] Hagler Bailly Consulting, Inc. and Overseas Bechtel, Inc., *Profile of Energy Efficiency Business in Egypt*, prepared for USAID/Cairo ECEP program, 1995.

subsidized electricity prices for most Egyptian households, 4) no easy way to determine the relative energy efficiency of appliances and equipment sold in the market, and 5) import duties on imported appliances and equipment, including energy efficient models. It is for many of these reasons that national governments have adopted equipment energy standards. These include Europe, U.S., China, South Korea, Thailand, and the Philippines. Equally important elements of these countries' standards are both setting a technical standard and establishing enforcement through testing and labeling activities.

Strategy to Overcome These Barriers

There are many favorable reasons for adopting standards. They produce substantial energy savings by setting a minimum level of efficiency that is achieved over hundreds of thousands or millions of new units sold over a period of years. Standards are highly cost-effective compared to voluntary efforts that rely on promotion, advocacy, and individual consumer decisions. The U.S. experience produced a 3/1 benefit-cost ratio to energy consumers for the standards activities.[30] Moreover, standards set a threshold, above which manufacturers can still compete in the market and offer additional features or benefits to equipment buyers.

For the GEF project, a strategy is undertaken to select two of the most promising classes of equipment for which to develop energy efficiency standards. Ideally one class will be electric equipment that is bought by customer classes paying unsubsidized electricity prices (industrial, commercial, and higher income residential households), and the second will be thermal equipment (which offers greater GHG benefits) used in industrial facilities.

Initially the code should be applied on a voluntary basis to allow time to put critical activities in place -- testing, certification, labeling, and promotion. Testing and labeling have proven to be the most effective components of standards programs. These two activities give consumers and equipment buyers the information they need to make an informed decision about the energy use and costs of competing equipment. The GEF project includes activities to actively promote the initial two energy standards.

A voluntary approach parallels the current thinking of the Egyptian Organization for Standards and Quality, which is trying to foster a sense of global marketing and competition among Egyptian businesses. A voluntary approach is also consistent with the GOE philosophy of increasing privatization and market competition among historically government-owned manufacturing enterprises. A

[30]Nadel and Goldstein, previously cited.

voluntary approach will ease the transition for manufacturers to acquire newer technology, provide time for manufacturers to assess market demand, and enable them to make necessary adjustments to product lines and production equipment. This approach also provides time for the government to establish administrative mechanisms for testing and labeling, and for manufacturers to gauge market response to how buyers use energy use information and labels to make purchase decisions. After a year or more of the voluntary program, the Government and industry should then be prepared to make the standards mandatory.

A voluntary standard can be administered in either a technical way (e.g. giving absolute scores of efficiency from 70-100 percent, coefficient of performance, or estimated energy use per hour) or in a user-friendly fashion (a good, better, best system; or a 2-star, 3-star, 4-star system). The latter system is often called a "quality mark" system in Egypt. One or another system may be best depending on the class of equipment, and the type of buyer (e.g. consumer or industrial). These determinations will be made according to the activity plans outlined in the description of objectives, outputs and activities in Section D.

Objective 3: Energy Efficient Building Code or Standard

Prior to the introduction of the first energy efficiency code (a voluntary set of professional design guidelines) or standard (a mandatory set of technical specifications) for buildings, most countries identify the economic potential to reduce the energy requirements of new buildings by 50% by applying the best design principles. The likely savings from mandatory standards will depend on the level of building design education, the degree of understanding of energy efficiency principles and costs among designers and construction companies, the economic motivation of owners and developers, and the importance of energy efficiency to national energy decision makers.

Many countries have adopted energy efficiency codes and standards for their new buildings. These include not only Israel and work underway in Tunisia, but also Australia, Canada, China, Japan, New Zealand, northern Europe, Pakistan, South Korea, Thailand, and the United States. The reason for adopting building energy codes is that there is substantial energy to be saved. The U.S. estimates it is possible to achieve an additional 35% efficiency improvement in new standards, over those efficiency standards that were already in place in 1990.[31] New Zealand adopted a very simple, low level of energy efficiency standards relying on purely technological solutions and has seen an 18% improvement in the thermal (cooling, heating) performance of its new commercial

[31] John Duffy, *Energy Labeling, Standards and Building Codes: A Global Survey and Assessment for Selected Developing Countries*, International Institute for Energy Conservation, for USAID, 1996.

buildings. This does not count any benefits available from day lighting or natural ventilation.[32]

The Situation Preventing Good Practice for Energy Efficient New Buildings

Despite the considerable energy savings available, many designers, builders, and owners are either unaware or disinterested in selecting building designs to reduce energy requirements and the associated operating costs. The most common reason for this is that the designer or builder makes the design decisions, and not the individuals who will occupy the buildings and pay the energy bills. Since many energy efficiency design features have a higher initial cost of materials or labor (this is true more in residential buildings, since good design in commercial buildings can actually lower the cost of mechanical equipment), there is a tendency of builders to ignore efficiency issues to keep first costs as low as possible. Another reason efficiency is ignored is that decision-making is diffuse, and no one person is assigned responsibility to optimize design for a building's energy requirements. Governments intervene by adopting building energy codes that are in the best interest of occupants, owners, and society.

Energy savings are not automatic even from good building design that is sensitive to the climate and maximizes comfort (through light colored paint, thick walls, insulating material, minimal glass areas on walls exposed to hot sun, natural ventilation, and vegetation shading). If a building does not have air conditioning equipment to begin with, good design will not save energy. If a rural house has no electricity, design for daylight will not save electricity. Some of the building research in Egypt addresses comfort, regardless of whether energy will be saved. Although this is beneficial to the occupant, there may not be an immediate reduction in GHG emissions.[33] Thus in the context of the GEF project, energy savings will come from those design improvements that reduce commercial energy forms, such as when electricity or gas is planned to operate air conditioning, ventilation, hot water heating or lighting. The focus of initial building code work thus should be placed on design improvements to these end uses of energy.

[32]Nigel Isaacs, et. al., "Development of a Minimum Requirements Energy Code", from the proceedings of the *ACEEE Summer Study on Energy Efficiency in Buildings*, Volume 5, 1996.

[33]An important issues to consider in the course of developing standards is the fact that as a country experiences economic growth, accompanied by greater business profits and higher household incomes, there is a tendency to add air conditioning equipment to residences and commercial buildings. Thus, standards for new buildings might consider the likely future use of air conditioning either through requirements for the building shell, or in the standards that might be applied to air conditioning equipment (See Objective 2 of this component.)

Strategy for Overcoming Barriers

Developing energy efficiency codes or standards for new buildings is not as straight forward as is the case for individual equipment. For a new building, energy requirements are determined by three factors: the design of a building relative to its site (color, shape, exposure to sun, wind), building shell (floor, walls, roof), and energy-using equipment (lights, elevators, air conditioning, hot water system). A goal of energy efficient new buildings can address all of these in a variety of combinations. Some features have greater effects on energy use than others. A code of good practice for energy efficient design can suggest options without dictating specific solutions. To understand these options professionals and building construction companies will require information, examples, and tools for energy analysis. Well-informed building owners and developers can request that builders and designers include energy-sensitive designs.

If funds are limited, as is the case in this GEF project, energy planners and building analysts should do reconnaissance work at the beginning to identify the most promising opportunities to improve energy efficiency. This could be for certain types of buildings (for example, large commercial buildings) or for the most significant energy uses (lighting, air conditioning). At this time little energy is used in homes for air conditioning, which might rule out a focus on residential building design. However, thought should be given to the longer term possibility that as household incomes rise in Egypt, residents might decide to install air conditioning units. This possibility should be considered before choosing the final areas for focus. The best prospects should become the focus for initial work on a code of practice for energy efficient design.

An energy efficiency building code could be either voluntary or mandatory. A voluntary code can aspire to higher levels of efficiency, and serve as a model for designers and builders to emulate. However, participation may be low -- and without a strong demand from owners the design improvements may be taken up by only a small percentage of builders and designers. A mandatory standard would be applied to all new construction meeting the eligibility rules, without any choice by the builders and designers. Mandatory standards typically set a lower threshold of efficiency to gain the greatest support for adoption. Mandatory standards need a mechanism to assure compliance, investigate those who might be ignoring the standard, and apply some kind of enforcement activity.

In the case of Egypt, a voluntary standard is recommended for the initial phase of work. This provides time to increase knowledge and acceptance of the ideas, to prove the possible energy savings, and to demonstrate the financial and personal benefits to owners and occupants. Successful implementation requires understanding of the benefits, demand for good design, capability with analytical

tools, and knowledge of specific design, materials, technology, and construction solutions. The project will focus on achieving these through the development and distribution of professional education materials, training activities, and assessment of mechanisms that can verify compliance.

Enforcement of just about any mandatory regulation, standard, or code in Egypt today is difficult. This is due to inadequate knowledge, unclear priorities, and sometimes the power of money. The strategy for Component 2, Objective II is to improve energy use in new buildings through a focus to create and build capabilities until such time as the desire and will are created to impose energy codes on all or selected types of new building construction. At such time, the state of the building industry's capabilities can guide decisions as to the level of efficiency that would be sought in a mandatory code (for example whether the minimum that most buildings can achieve, an intermediate level that requires higher skills in design and construction trades, or a high level of performance that requires a more analytical approach to design). At a minimum, by the year 2002 this standard should apply on a mandatory basis to the subset of commercial buildings that is responsible for a significant amount of energy use.

Objective 4: Energy Efficiency Center

To grow, developing markets need information that is accessible, reliable, and relevant. Without it, the energy efficiency market in Egypt will be slow to emerge. Important gaps in energy efficiency information within and outside EEA are posing barriers to a viable energy efficiency market. Activities under Output IV will address these barriers.

Barriers

Egypt lacks effective market information about key energy efficiency issues. The most recent estimates on the country's energy efficiency potential continues to rely in part upon 1990 data. Groups such as TIMS and DRTPC have only recently begun collecting data on the savings potential of specific facilities through energy audits. There is no central source to provide information to consumers on the availability of energy service company assistance. Energy service providers lack data on the availability to equipment and engineering services that could support their business efforts. Such a lack of information is a key barrier.

A lack of information represents a barrier to energy efficiency policy within EEA as well. Historically, EEA has lacked the capability to evaluate the potential contribution that energy efficiency could make to its long-term resource planning. Instead, EEA has focused only upon supply side resources, mostly oil and gas-fired steam generating units. For this reason, some individuals have questioned EEA's commitment to energy efficiency.

EEA has only recently begun acquiring capabilities to perform integrated resource planning, through technical assistance provided by Gilbert Commonwealth and others. With these new capabilities, EEA is now in the position to begin evaluating the potential contribution of energy efficiency measures on a level playing field with supply side resources.

EEA continues to lack, however, information about the role that energy efficiency can play in its long-term planning. It has no reliable information on the long-term technical and economic potential of energy efficiency in Egypt. EEA cannot properly evaluate the effectiveness of energy efficiency measures relative to supply-side options, because it lacks information on the cost per kWh of various energy efficiency measures. EEA also lacks information about how the technical and economic potential of energy efficiency varies by region and among customer groups.

Strategy for Information and Promotion

EEA will be well-positioned to collect and disseminate this information. As a strong, nationally recognized company, EEA has the institutional capability and respect within the marketplace to provide credible and timely market information. The activities proposed under this task will provide EEA access to new information that will help foster market growth. It is also expected that EEA's customer service function may include EEA representatives providing educational presentations to schools, technical and service organizations. The Energy Efficiency Center can provide a focal point for much of the end-use information and technical knowledge that EEA intends to offer to its customers.

With information collected under Component 2 of the proposed GEF project, EEA will be able to obtain such information and process in a way that will help EEA in its long-term planning. With these new capabilities, EEA will not only be able to re-direct its own, internal efforts towards greater reliance upon energy efficiency, but can also begin taking on a leadership role in promoting energy efficiency within Egypt's overall national energy plan.

Component 3

The operational objective by the end of the project is to have established and institutionalized within EEA the means through which there is continued advocacy and assistance for EEA customers to use energy resources in the most efficient manner possible. This includes their direct use of electricity, as well as use of fuel resources (mazout, natural gas, and agricultural biomass) for process heat and other uses, and the combination of power generation and thermal energy requirements in cogeneration

systems with the possibility of selling surplus electricity to the grid. Included within this operation objective is the need for an established training program initially to serve the training needs of EEA staff in the technical, financial, legal and contractual aspects of cogeneration, and subsequently to serve the training needs of potential small power producers, as well as other personnel within the electricity establishment in the zones and EDCs.

Section C: DEVELOPMENT OBJECTIVE

To meet suppressed and still growing power and energy demands through reliable, efficient and rational consumption patterns, thereby reducing greenhouse gas emissions, protecting the local environment while at the same time reducing providing a sustainable alternative to capacity expansion as the sole method of meeting demand.

This UNDP/GEF project will contribute to meeting the above objective by removing barriers to energy efficiency and conservation measures through the initiation of energy audit activities, promoting energy services, encouraging sound energy policy, encouraging maximum private sector participation and lastly by making key information readily available to all players in the Egyptian energy sector.

SECTION D
Component 1

Section D: IMMEDIATE OBJECTIVES, OUTPUTS AND ACTIVITIES

Component 1: Loss Reduction, Load Shifting and Load Management in the Unified Power System (UPS)

Immediate Objectives:

1. Reduce transmission losses of UPS from 7% to 5%.
2. Set priorities for improving dynamic response of all thermal stations.
3. Reduce transmission losses through network analysis and control strategies.
4. Introduce a TOU tariff to encourage load shifting.

Improvement Targets (by the year 2010)

Objective 1 Reduction of transmission losses from 7% to 5%.

Objective 4 Reduction in magnitude of daily load swing (peak to minimum demand) to 25% of average load through load management.

IMMEDIATE OBJECTIVE 1: REDUCE TRANSMISSION LOSSES

To improve capability of UPS Operations Department for transmission network loss reduction measurements and to reduce transmission loss from 7% to 5%.

Party responsible for Objective 1 is the National Energy Control Center.

Success Criteria

by the end of the project, EEA will have established a state-of-the-art calibration and maintenance facility for all transmission system performance measurement equipment;

- by the end of the project, EEA will have mounted a training program for the calibration and maintenance of transmission system measurement equipment;

- by the end of the project, EEA will have established a procedure for incorporating results of improved loss reduction measurements into the on-going identification of specific network locations where loss reduction is advantageous, and the routine scheduling of appropriate mitigation actions.

SECTION D
Component 1

This objective will be met through the following three outputs:

Output 1.1 An improved calibration and maintenance facility for transmission system measurement equipment.
Output 1.2 A training program in transmission system loss measurement.
Output 1.3 Assessment of network loss.

Output 1.1 Improved calibration and Maintenance Facility

An improved calibration and maintenance facility for transmission system measurement equipment, such facility to be available at the end of the first year of the project.

Activities for Output 1.1

Conduct or update, as required, a systematic review of the age, status, and condition of calibration and measurement equipment. Identify, specify, acquire, and install state-of-the-art calibration and maintenance equipment.

1.1.1 Assess existing calibration and measurement equipment for measuring losses in the transmission network.

1.1.2 Assess need for primary standard calibration equipment, and for calibrating and standardizing field measurement equipment.

1.1.3 Following completion of activities 1.1.1 and 1.1.2, specify, acquire, and install new calibration and measurement equipment.

1.1.4 Establish periodic inspection, calibration and maintenance schedules for every instrument.

1.1.5 Translate all equipment manuals and instructional documents into Arabic; and establish hardcopy and software archives for all equipment documents.

Output 1.2 Training Program in Transmission System Loss Measurement

A training program in transmission system loss measurement. This program will be mounted during the second year of the project, including development of all materials and schedules. The program will be offered periodically during the third year of the project.

Activities for Output 1.2

Establish a training program within the EEA training establishment in the proper use, calibration, and maintenance of transmission system calibration and measurement equipment, and offer the training program periodically at major training sites for the benefit of EEA and Zone company engineers.

1.2.1 Assess EEA training programs for use, calibration, and maintenance of transmission system calibration and measurement equipment.

1.2.2 Update training programs or establish new programs to incorporate newly acquired state-of-the-art equipment. Recruit three field measurement engineers from EEA headquarters and Zones who will be seconded for a period of one month for this purpose. The training program will include an on-site field measurement training experience. (It is recommended that field measurement engineers be selected initially from Alexandria and Upper Egypt Zones, based primarily on their length of experience working on the transmission network.)

1.2.3 Establish a training schedule and venue. The initial offering of the raining program will be conducted jointly by the three field measurement engineers who established the course under Output 1.2.2. Subsequent offerings of the training program will be conducted by them individually on a rotating basis. Replacement trainers will be recruited and supervised as necessary.

Output 1.3 Assessment of Network Loss

This is an on-going procedure in a well-managed network such as the UPS. The contribution of this project to network loss assessment is associated with incorporation of improved measurements into this on-going process. This improvement will occur in the second year of the project, and be continuous thereafter.

Activities for Output 1.3

Build on the improvements in calibration and measurement equipment for determination of network losses in order to review and modify existing methodology for loss measurements, and establish updated protocol for taking loss measurements.

1.3.1 Assess current loss measurement procedures and schedules.

1.3.2 Update and modify loss measurement procedures and schedules to appropriately incorporate improved calibration and measurement equipment.

1.3.3 **Revise schedule for periodic, comprehensive measurement and** assessment of network loss.

1.3.4 Incorporate revised schedule for loss assessment into on-going procedures for network loss reduction.

IMMEDIATE OBJECTIVE 2: SET PRIORITIES FOR DYNAMIC RESPONSE

To measure dynamic response of all thermal stations that are capable of automatic dispatch, and to set priorities for dynamic response improvement, as necessary.

Party responsible for Objective 2 is the National Energy Control Center.

Success Criteria

- by the end of the project and as part of on-going network control, EEA will have developed and implemented a program for the routine, periodic testing of generating unit dynamic response to dispatch signals from the energy control center;

- by the end of the project, EEA will have established a procedure for:

    - the periodic, routine assessment of generating unit dynamic performance;

    - the comparison of generating unit dynamic performance with original specifications and delivery guarantees for newer units and with generic capabilities for older units;

    - the identification of specific generating units where restoration or improvement of dynamic response capability is desirable.

- by the end of the project and as part of the on-going scheduling of generating unit maintenance, EEA will have established procedures through which mitigation actions regarding generating unit dynamic response can be conducted during

periods of scheduled maintenance, in full coordination with other on-going plant performance programs.

The objective will be met through the following three outputs:

Output 2.1 Measurement of generating unit dynamic response.
Output 2.2 Assessment of generating unit dynamic performance and set of generating unit performance targets.
Output 2.3 Program and schedule for upgrading generating unit dynamic response.

Output 2.1 Measurement of Generating Unit Dynamic Response

Activities for Output 2.1

Test the dynamic response of individual generating units to determine the rate at which units can ramp up and ramp down their generation output. Testing procedures will be developed during the first year of the project, with actual testing and analysis occurring and continuing throughout the second and third years of the project.

2.1.1 Develop procedure and schedule for testing dynamic response of individual generating units. Coordinate with power station operations personnel. Gather or update plant operational history, derating schedule, history of plant modifications and control system modifications.

2.1.2 Conduct dynamic response tests. Typical tests to be conducted during off-peak hours, by sending dispatch signals for plus/minus 5% changes in steady-state generating unit output at near-maximum, mid-range, and near-minimum generation levels. Generating unit performance and strip chart recordings to be tracked at the power station and the dispatch center.

2.1.3 Analyze dynamic response tests to determine generating unit ramp rates for loading and unloading at selected load levels. Compare ramp rates with performance specifications, delivery guarantees (if appropriate), and generic capabilities for similar technology units.

Output 2.2 **Assessment of Generating Unit Dynamic Response and Performance Targets**

An assessment of generating unit dynamic performance and a set of generating unit performance targets, such assessments and targets to be formulated in the third year of the project.

Activities for Output 2.2

Establish target values for generating unit dynamic response.

2.2.1 Establish a prioritized schedule for dynamic performance evaluation of generating units in coordination with other generating unit performance studies.

2.2.2 Identify generating units whose observed ramp rates are below standard (not in conformance with delivery guarantees or generic capabilities for similar technology units).

2.2.3 Establish target values for generating unit ramp rates based on original specifications or guarantees, or on accepted generic performance standards for each type of unit.

Output 2.3 **Program and Schedule for Upgrading Generating Unit Dynamic Response**

Program and schedule for upgrading generating unit dynamic response, such program and schedule to be specified six months before completion of the project.

Activities for Output 2.3

Scheduling of maintenance activities designed to improve generating unit dynamic response in order to achieve target values for ramp up and ramp down rates for generation output.

2.3.1 Establish prioritized schedule for generating unit maintenance for improvement of dynamic response.

2.3.2 Determine primary and secondary causes for why generating units are not performing at target values for dynamic response. Possible causes can include: plant control system inadequate or improper

function; derating of auxiliary and balance-of-plant equipment; leakage; fouling of heat transfer surface; etc.

2.3.3 Specify mitigation actions to restore dynamic response for ramp up and ramp down capability to conform with delivery guarantees or generic capability of similar technology units.

2.3.4 Implement necessary mitigation actions within on-going schedule of generating unit maintenance and repair.

IMMEDIATE OBJECTIVE 3: NETWORK ANALYSIS AND CONTROL STRATEGIES

To enhance network loss reduction through network analysis and control strategies.

Party responsible for Objective 3 is the National Energy Control Center.

Success Criteria

- by the end of the project, EEA will have installed routine procedures for updating plant dynamic response parameters in network control strategies;
- by the end of the project and as part of on-going network analysis, EEA will have developed and adapted control algorithms that add minimization of network loss to dispatch strategies;
- by the end of the project as part of on-going network analysis, EEA will have characterized the impact on network loss and security of small power projects that deliver new capacity into the network.

This objective will be met by the following two outputs:

Output 3.1 Routine procedure for updating generating unit parameters in network control software.
Output 3.2 Assessment of network loss through simulation studies and implementation program for reducing network loss.

SECTION D
Component 1

Output 3.1 Procedure to Update Generating Unit Parameters

Routine procedure for updating generating unit parameters in network control software.

Activities for Output 3.1

Develop a routine procedure for incorporating updated ramp rates following generating unit maintenance repairs, and for periodic adjustments from on-going transient response testing.

3.1.1 Assemble tables of generating unit parameters from on-going maintenance and testing activities.

3.1.2 Install updated parameter values at scheduled revision intervals for operational load control software.

Output 3.2 Assessment of and Implementation Program to Reduce Network Loss

Assessment of network loss through simulation studies and implementation program for reducing network loss.

Activities for Output 3.2

Conduct network simulation studies based on (1) utilization of loss minimization dispatching strategies and (2) incorporation of additional generation from distributed small power sources. On the basis of simulation studies, incorporate loss reduction strategies into network dispatch control algorithms.

3.2.1 Assess and acquire software packages that incorporate loss reduction algorithms within load control strategies.

3.2.2 Test and evaluate loss reduction software through network simulation studies.

3.2.3 Extend loss reduction simulation studies to include added generation from small power projects (1 to 10 MW) at various locations within the network (typically at remote locations along heavily utilized radial transmission lines with many customers and poor regulation).

3.2.4 Implement network control strategies for loss reduction consistent with customary requirements for dispatch based solely on cost and security .

3.2.5 Assess possibilities for loss reduction taking into consideration that the present percentage of losses is 6.5%, determination of loss target should be based on power system modeling and considering EEA's system expansion.

3.2.6 Assess factors affecting the transmission losses and means for improvement to reach the targeted value.

IMMEDIATE OBJECTIVE 4: LOAD SHIFTING ACHIEVED THROUGH TOU TARIFF

To develop, seek approval for, and notify a time-of-use tariff schedule/structure for all EEA customers including feeding points to the EDCs and EDC's industrial customers. The tariff will encourage load shifting from peak to off peak periods.

Party responsible for Objective 4 is the Planning and Economic Studies Department, Tariff Studies Group. A Director of Load Shifting will be responsible for implementation of activities (including training) together with PTD and International Tariffs Expert (when in country).

Training activities to be undertaken as part of achieving this objective are shown in Annex 4. It is suggested that initial training be undertaken as soon as training material is available (to be supplied by International Tariffs Expert). However, the Study Tour associated with this activity is proposed undertaken after work on tariff design has been underway for some time.

Success Criteria

- by the end of the project, EEA will have installed time-of-use meters for all EEA directly connected customers;

- by the end of the project, EEA will have initiated a program to install time-of-use meters for feeding points to EDCs;

- by the end of the project, EEA will have developed and submitted for approval a time-of-use tariff for all EEA customers equipped with time-of-use meters;

- if such approval is received before the completion of the project, EEA will proceed through customary means to officially notify the tariff to all affected customers;

- by the end of the project, EDCs would have initiated a similar program for its large industrial customers with the support of EEA.

This objective will be met through the following five outputs:

Output 4.1 Usage of time-of-use meters by EEA direct customers.
Output 4.2 Time of Use meters fort he feeding points to EDCs
Output 4.3 Definition of daily peak and off-peak periods.
Output 4.4 Financial analysis to determine effect on the long run marginal cost of generation associated with reductions in the daily ratio of peak demand to average demand resulting from load shifting in the industrial sector.
Output 4.5 Time-of-day tariff proposal for industrial sectors.
Output 4.6 Usage of time-of-use meters by EDC industrial customers.

Output 4.1 EEA Direct Customer TOU Meters

Usage of time-of-use meters by EEA direct customers.

Activities for Output 4.1

Complete on-going program for time-of-use meter installation. (At time of document preparation, 50 meters and 21 meter summation units had been installed out of the total number of 344 meters and 105 meter summation units that were planned.)

4.1.1 Complete installation of time-of-use meters and summation units at EEA direct customers in all Zones.

4.1.2 Establish administrative procedures for time initialization and reading of time-of-use meters.

Output 4.2 Time of Use meters for the feeding points to EDCs

Activities for Output 4.2

4.2.1 Complete installation of time-of-use meters and summation units at all feeding points to EDCs.

4.2.2 Establish administrative procedures for time initialization and reading of time-of-use meters.

Output 4.3 Definition of Daily Peak and Off-Peak Periods

Definition of daily peak and off-peak periods.

Activities for Output 4.3

Analysis of daily demand patterns in the overall system, and specifically in the industrial sector, in order to specify the time intervals of occurrence of the daily peak demand and the daily minimum demand and the manner in which they shift throughout the year.

4.3.1 Define the duration of the daily peak period, and the manner in which it shifts throughout the year, on a monthly or seasonal basis.

4.3.2 Define the duration of the daily minimum period, and the manner in which it shifts throughout the year, on a monthly or seasonal basis.

Output 4.4 Analysis of LRMC Changes from Load Shifting

Financial analyses to determine effect on the long-range marginal cost of generation (LRMC) associated with reductions in the daily ratio of peak demand to average demand resulting from load shifting in the industrial sector.

Activities for Output 4.4

Preparation of the financial basis for setting time-of-use tariffs, to insure that the time-of-use tariff will create a significant motivation to shift load from peak to off-peak intervals, without significantly reducing income from electricity sales with respect to LRMC. Average value of the tariff for the 24-hour period shall be equivalent to the existing constant tariff such that the average cost of electricity for a customer with constant load during the 24-hour period would remain unchanged; the savings will occur only as a result of load shifting.

4.4.1 Review studies on the effect that time-of-use tariffs have in motivating changes in industrial customer demand patterns.

4.4.2 Develop low, medium, and high scenarios for load shifting in response to selected time-of-use tariff levels.

4.4.3 Evaluate the impact on future requirements for installed capacity for each of the load shifting scenarios and the customary growth options.

4.4.4 Select a time-of-use tariff which balances lost revenue resulting from load shifting against changes in LRMC associated with modified growth in capacity.

Output 4.5 Time of Day Tariff for Industrial Sectors

Time-of-day tariff proposal for industrial sectors.

Activities for Output 4.5

Development of a tariff schedule with two tariff periods within the 24-hour interval.

4.5.1 Prepare tariff tables for industrial customers with time-of-use meters for each power service voltage represented.

4.5.2 Propose tariff for Cabinet approval.

4.5.3 Notify tariff to customers and prepare informational package for wide dissemination in the industrial sector.

Output 4.6 EDC Industrial Customer TOU Meters

Usage of time-of-use meters by EDC industrial customers.

Activities for Output 4.6

Specification of type of meter required, conduct of pilot program, and search for donor or national funds to support meter acquisition for all industrial customers.

4.6.1 Coordinate with EDCs in developing a program to acquire time-of-use meters, and select two EDCs for a pilot demonstration program.

4.6.2 Review types of meters and select one or several types to be evaluated that appear suitable for EDC industrial customers; consider manual and remote readout options.

4.6.3 Acquire 20 meters of each type with UNDP/GEF project funds.

4.6.4 Coordinate installation of meters with EDCs in the pilot program.

4.6.5 Investigate donors and other sources for major purchase of time-of-use meters for all EDC industrial customers.

Section D: IMMEDIATE OBJECTIVES, OUTPUTS AND ACTIVITIES

Component 2: Energy Efficiency Market Support

Immediate Objectives:

1. Energy Services Industry Support and Promotion
2. Energy Efficiency Standards for New Equipment
3. Energy Efficient Design and Construction for New Buildings
4. Energy Efficiency Center

Improvement Targets (by the year 2010)

Together, by the Year 2010, the four objectives of Component 2 will reduce energy consumption by a total of 8.3% compared to current levels and reduce CO_2 production by 8.25 million tons per year.

Objective 1 To facilitate a 3.8% reduction in total energy demand relative to Egypt's current consumption, by removing key business and financing barriers to energy efficiency (lack of customer awareness, the need for companies to transform their business, and a lack of availability of financing at attractive rates), eliminating 3.77 million tons of CO_2 per year.

Objective 2 To develop and begin to implement energy efficiency standards for two classes of major energy-consuming equipment that together will improve efficiency of total energy use by about 3.4% compared to current levels, eliminating 3.4 million tons of CO_2 per year.

Objective 3 To facilitate a minimum 40% reduction in new commercial building energy use by developing and beginning to implement voluntary codes that will eventually be applied as a mandatory standards, thereby reducing energy consumption by 1.1% and eliminating 1.08 million tons of CO_2 emissions per year.

Objective 4 To facilitate the above activities by promoting increased customer awareness and strategic actions by public and private sector energy market participants through an energy efficiency center.

SECTION D
Component 2

IMMEDIATE OBJECTIVE 1: ENERGY SERVICES INDUSTRY SUPPORT AND PROMOTION

To facilitate a 3.8% reduction in electricity demand (compared to current levels) by 2010 through a three year program to foster continued growth of Egypt's energy services industry by removing key barriers to customer awareness, business transformation, and capital financing that currently impair the energy efficiency industry.

EEA shall be the executing agency responsible for achieving these objectives. The Auditing and Technical Services Work Group and the Business and Finance Work Group shall be primarily responsible for helping the Project Technical Director (PTD) to execute these tasks. These two work groups shall be assisted by the Information and Promotion Work Group.

Success Criteria

By the end of the project, EEA will have:

- performed and facilitated electrical and thermal plant audits for 20 of its large-scale industrial customers and provided incentives trough cost sharing activities budgeted in this product to electricity distribution companies (EDCs) for the performance of 200 thermal and electrical audits for customers served by EDCs.

- provided "business transformation" seminars to help provide guidance to the energy services industry on how to provide more comprehensive energy efficiency services and practical information about energy service business issues.

- developed an effective and methodical approach to achieving customs reclassification of energy efficient equipment and lobbied effectively to achieve custom duty reductions for major energy-efficient, industrial, commercial, and residential technologies.

- designed a residential, compact fluorescent lamp (CFL) lighting program for distribution to EDCs and begun working with as many as two interested EDCs to implement this program.

- implemented a pilot program to provide partial loan guarantees to support the technical performance of select, partially private companies.

SECTION D
Component 2

Summary of Outputs

Output 1.1 Performance and facilitation of 20 energy audits at the facilities of medium and large-scale customers in the industrial and commercial sectors and provision of cost-sharing incentives for the performance of 200 audits at facilities served by EDCs, focusing on specific electrical and thermal energy uses that are likely to have significant impacts.

Output 1.2 Providing business advisory services to overcome contractual, legal, and other business start-up barriers that are inhibiting the energy service industry's ability to exploit energy efficiency opportunities and transform individual businesses into viable companies offering comprehensive energy efficiency services.

Output 1.3 Encouraging a reduction of custom duties on approximately three major classes of industrial, commercial, and residential energy efficient equipment (e.g., industrial motors or compressors, energy-efficient street lighting, agricultural pumps, commercial sector fluorescent lighting), thereby increasing the availability of imported energy efficiency technologies and providing incentives for greater local manufacturing of energy efficient end-use equipment.

Output 1.4 Designing, packaging, and marketing a CFL leasing program similar to the program being considered by the Alexandria EDC and facilitating its implementation by 2-3 additional EDCs, thereby reducing peak demand by 600 MW, saving more than 2,000 GWh/year and reducing CO_2 emissions by over 25,000 tons/year.

Output 1.5 Performing a pilot program to provide partial guarantees to support performance contracts in loans provided to partially privatized firms, thereby reducing CO_2 emissions by over 25,000 tons/year.

Output 1.1: Energy Audits

Performance and facilitation of 20 energy audits at the facilities of medium and large-scale customers in the industrial and commercial sectors and provision of cost-sharing incentives for the performance of 200 audits at facilities served by EDCs. These audits shall help reduce energy consumption in Egypt by 0.3% compared to current levels and will facilitate a 0.33 million ton per year reduction in CO_2 emissions.

Audits will focus upon specific electrical and thermal energy uses that are likely to have significant impacts rather than attempting to provide a comprehensive audit of individual

facilities. Each audit will describe the technical and economic potential for energy savings and outline a recommended energy savings strategy for facility procurement decision makers. Audits will remove barriers to the energy services industry by increasing customers' awareness of energy efficiency potential and by providing "proof of concept".

EEA shall be the implementing authority for these outputs though the Auditing and Technical Services Work Group and under the leadership of the PTD. Consulting, contracting, training, and other supporting agencies shall be provided by auditing training and consulting firms specializing in facility audits (e.g. TIMS and DRTPC).

Activities for Output 1.1

1.1.1 Specify an audit program for EEA's direct service customers by:

- identifying potential audit recipients
  defining the scope of audits (in terms of types of equipment and facilities and potential energy efficiency measures)
- developing a schedule for performing audits
  describing audit reports.

The specified audit program will focus upon a select number of thermal and electrical end-use efficiencies for which there is a reasonable to high likelihood of significant energy savings such as process control improvements and energy-saving natural gas conversions.

1.1.2 Develop and execute a plan to develop auditing capabilities at EEA, through:

- identification of staffing needs (e.g., number and type of staff required)
- recruitment, hiring, and training of staff
- assessment of contracting needs
- specification of overhead requirements.

1.1.3 Prepare and deliver an auditor training program through development of training course outlines, preparation of course materials, and delivery of auditing courses. Two-month, initial auditing courses will be provided to all new auditors. Each year over a three year period, auditors will also receive one week follow-up training sessions that provide lessons from the

program's experience. Training will focus upon the select number of electrical and thermal energy-use measures specified for this program.

1.1.4 Deliver comprehensive facility audits to 20 EEA direct service customers. Electrical audits shall be performed directly by EEA staff; thermal audit shall be contracted to existing auditing firms specializing in thermal energy audits. Prepare reports describing energy savings potential, assessing costs and benefits of energy efficiency measures, recommending an implementation plan for energy efficiency measures, and providing guidance on how to implement recommended measures. Two types of reports shall be prepared: (1) a brief, executive-level summary of findings of conclusions and recommendations describing the economic and financial consequences of each recommendation; and (2) a supporting report providing documentation for findings, conclusions, and recommendations.

1.1.5 Follow-up with audited customers (one year after audits). Follow-up assessments will:

- identify recommended measures installed and not installed
- assess customers' reasons for installing or not installing measures
- provide guidance to customers not installing measures.

Based on these reports, perform annual assessments of the program experience to identify ways that future audits might be improved and provide information needed for follow-up, auditor training provided in Activity 1.1.3. Reports shall also be used to provide ongoing guidance for improving the content and quality of audit reports.

1.1.6 Develop an incentive program for customers served by EDCs, under which the Project would share costs with EDCs and/or their customers for performing audits. EDCs will have strong incentives to participate in this program because of the direct incentives provided by EEA. Also, provision of audits will help EDCs to improve customer relations and may help EDCs better manage customer demands, thereby reducing peak time energy charges. Development of the incentive program will require EEA to specify:

- program eligibility guidelines (e.g., size, industry, and credit condition of customers)
- level of cost sharing among EEA, EDCs, and customers
- requirements for EDC-implemented audits
- program monitoring procedures
- schedule for program implementation and expiration
- other legal provisions (e.g., termination, liability, force majeure, assignment).

The specified audit incentive program will focus on a selected number of thermal and electrical end-use efficiencies for which there is a reasonable likelihood of significant energy savings such as process control improvements and energy-saving natural gas conversions.

1.1.7 Implement audit incentive program for 200 customers served by 2-3 EDCs. Solicit and negotiate EDC participation. Amend program specifications as required for program success. Determine schedule for each EDC program. Assign program responsibilities within EEA and EDCs.

1.1.8 Monitor program progress in terms of:

- number of EDCs participating
- number of audits provided by each EDC
- quality, timeliness, and effectiveness of audit reports
- recommended measures installed and not installed
- customers' reasons for installing and not installing measures
- guidance provided to customers not installing measures.

Based on this monitoring, perform annual assessments of the program experience to identify ways that future audits might be improved. These reports shall be shared among EDCs and contractors to provide industry-wide information on how to improve future audits throughout Egypt's energy service industry.

Output 1.2: Business Advisory Services

Provide business advisory services to overcome contractual, legal, and other business start-up barriers that are inhibiting the energy service industry's ability to exploit energy efficiency opportunities and transform individual businesses into viable companies offering comprehensive energy efficiency services. These business advisory services shall help create and sustain new energy service industries in Egypt, thereby facilitating a 0.3% reduction in Egypt's total energy consumption (compared to current levels) and a 0.28 million tons per year reduction in CO_2 emissions.

Information on ESCO business development, international energy service industry contacts, and other issues that is obtained through this task shall be institutionalized within EEA and shall be provided to the energy services industry on an ongoing basis through the information center established in Objective 4 of Component 2.

EEA shall be the executing authority for this output. Tasks will be implemented by the Business and Finance Work Group and shall be coordinated with the Information and Promotion Work Group. In the initial year of this program that coincides with the completion of ECEP program activities, the Business and Finance Work Group shall collaborate with ECEP by participating in ECEP-sponsored seminars[1] and inviting the participation of ECEP in an initial business transformation seminar. International and domestic consultants specializing in energy services shall assist the Business and Finance Work Group.

Activities for Output 1.2

1.2.1 Prepare and deliver a one day "business transformation" seminar for the energy services industry that will provide guidance to Egyptian businesses on how to provide more comprehensive energy efficiency services using practices and possibly to begin the process of becoming energy service companies (ESCOs). This seminar shall be held in the first year of the UNDP/GEF-sponsored project and shall be open to all segments of the energy service industry.

1.2.2 Participate in ECEP-sponsored business seminars that shall be provided to specialized groups within Egypt's energy service industry (e.g., equipment manufacturers, construction contractors,

[1]ECEP seminars yet to be determined. ECEP participants have, however, indicated that there would be seminars during the last year of the program that would cover issues such as performance contracting, marketing, and other issues. These seminars would be provided to firms currently engaging in the energy services industry or considering establishing energy service industries in the near future. ECEP participants have indicated that they would be interested in coordinating seminars with this GEF-funded program.

energy audit firms)[2]. Participation in these seminars shall depend upon the precise activities executed under the ECEP program.

1.2.3 Prepare and deliver a two day seminar on energy service business practices that will provide more business advice on advanced energy services business issues and that will supplement the seminars provided so far under ECEP. Seminar will provide expert training and guidance from global ESCOs and equipment manufacturers from Europe, the U.S. and other countries with strong energy service markets on:

- business development
- marketing
- customer relations
- contracting
- staffing
- business strategy
- international joint ventures
- other business and financial issues.

This seminar shall be held in the second year of the UNDP/GEF program.

1.2.4 Facilitate follow-up meetings and seminars in which global ESCOs and Egyptian energy service providers would work together to identify, discuss and attempt to solve problems of the Egyptian energy services industry. These follow-up meetings shall be held after the conclusion of the seminar provided in Activity 1.2.3.

1.2.5 Prepare proceedings and brief summary reports on each of the above-mentioned seminars and meetings (Activities 1.2.3 through 1.2.5) to record the relevant principles and conclusions presented. Distribute proceedings and briefing materials within the energy service industry.

1.2.6 Establish permanent sources of information within EEA on ESCO business issues that can be provided to the energy services industry on an ongoing basis under Objective 4.

[2]Refer to footnote 1.

SECTION D
Component 2

Output 1.3: Customs Duty Reductions

Encourage a reduction of customs duties on three major classes of industrial, commercial, and residential energy end-use equipment. These customs duty reductions will increase the availability of imported energy efficiency technologies and provide incentives for greater local manufacturing of energy efficient end-use equipment. Work under this output will contribute to important reductions in customs duties for energy efficiency equipment, thereby leading to a 0.3% reduction in energy use (compared to current levels) and a 0.25 million ton per year reduction in CO_2 emissions. This output shall also assess and document the net economic benefits of customs reductions in terms of greater energy savings and oil exports.

EEA shall be the agency responsible for executing activities under this output. The Business and
Finance Work Group shall be responsible for implementation of these activities, with the support of the Information and Promotion Work Group. EEA shall coordinate its efforts with other institutions within Egypt that may also be working for customs duty reclassification, including OECP, EDCs, and NREA.

Activities for Output 1.3

1.3.1 Identify three major classes of industrial, commercial, and residential energy efficient technologies that are not currently classified as energy efficient equipment. Select from this group a subset of equipment that is likely to have the greatest impact on energy efficiency in Egypt for which customs duty reductions are likely to have a large impact (e.g., equipment with largest total energy use, equipment where local equipment is highly inefficient). Prepare report identifying equipment selected and describing the methodology, findings, and conclusions of this assessment.

1.3.2 Assess the benefits and costs of changing customs duty classification from the subset of equipment that are likely to have the largest impact on energy efficiency in Egypt (See Activity 1.3.1). Assessment should account for costs such as customs income reduction and benefits such as energy savings and increased oil export revenue. Assessment should rely upon prior studies of customs duty reclassification, where available, and perform new research, where needed. Prepare a final report describing the study's methodology, findings, and conclusions.

1.3.3 Develop a promotion strategy to advocate official customs classification of selected equipment as energy efficient technologies. Promotion strategy should consider:

- key decision makers and implementing government agents responsible for reclassifying equipment as energy efficient for customs duties
- important motivating factors that would influence decision makers and implementing government agents to reclassify equipment as energy efficient
- role of analytical information in a lobbying campaign (including assessment described in Activity 1.3.2)
- need for and role of promotional materials
- information and communication channels
- ongoing activities of other groups working to promote customs duty reclassifications (e.g., OECP, EDCs, NREA).

1.3.4 Prepare promotional materials to support customs duty reductions, including discussion papers, memoranda, and other documents that rely in part upon the findings and conclusions of the report prepared in Activity 1.3.2.

1.3.5 Distribute information and promotional materials as needed based on promotion strategy developed in Activity 1.3.3.

1.3.6 Hold seminars and meetings involving government decision makers and implementing agents, presenting findings and urging authorities to reclassify equipment as energy efficient for customs duty purposes. Seminars and meetings shall be coordinated with other groups working to promote customs duty reclassifications (e.g., OECP, EDCs, NREA).

Output 1.4: Compact Fluorescent Lamp Leasing Program

Design, package, and market a CFL leasing program similar to the program being considered by the Alexandria EDC, to facilitate its implementation by 2-3 additional EDCs. By eliminating a financing barrier to energy efficiency investments, this program is expected to reduce electricity demand by more than 2,000 GWH/year and reduce CO_2 emissions by over 1.38 million tons/year.

SECTION D
Component 2

EEA shall be the agency responsible for executing activities under this output. The Business and
Finance Work Group shall be responsible for implementation of these activities, with the support of the Information and Promotion Work Group.

Activities for Output 1.4

1.4.1 Review and analyze the residential CFL leasing program designed by the Alexandria EDC and other comparable programs. Interview AEDC staff. Review program materials. Assess studies prepared for this program, including cost-benefit analysis, market penetration studies, peak demand and energy savings estimates. Assess experience of residential electricity equipment leasing programs in other developing countries. Prepare a brief report summarizing investigation and stating recommendations.

1.4.2 Use Alexandria EDC as a basis to design a program under which other EDCs would lease CFLs to customers and recover lease payments through existing billing mechanisms. Program design should specify:

- eligible CFL measures
- customer eligibility requirements
  CFL delivery and installation procedures
- payment collection provisions
- effect of new Egyptian leasing law[3]
- possible funding sources (including financing mechanisms identified and/developed under ECEP program and low-cost financing that may be available to low-income residential customers through Egypt's social fund)

1.4.3 Package the program designed in Activity 1.4.2 so that it is attractive to other EDCs. In packaging the program, specify the program benefits to EDCs and the environment in terms of:

- economic savings to EDCs by reducing unprofitable residential sectors sales
  customer relations benefits
- reductions in peak electricity demand and deferral of new capital investments
- reductions in GHG emissions

[3]Financial Leasing Law 95 became law in 1995. It allows for equipment leasing and grants lessors certain tax benefits (e.g., five years of tax exemption and the right to deduct equipment depreciation from taxes). Since passage of the law, 20 registered leasing companies have been established. However, the law has not yet been used for energy efficient equipment.

1.4.4 Disseminate the CFL leasing program to 2-3 EDCs. Distribute promotional material developed by AEDC and EEA. Publicize the program design in public forums. Conduct meetings with EDCs and representatives from other concerned parties.

1.4.5 Provide implementation assistance to 2-3 EDCs. Provide guidance based on the experience of the program's history to date at AEDC and other EDCs in Egypt as well as from the experience of similar programs in other countries. Advise on provisions for specific EDC programs. Provide suggestions for solving problems encountered by EDCs. Provide other implementation assistance as required.

Output 1.5: Loan Guarantee Program for Partially Private Companies

Perform a pilot program to provide partial guarantees to support performance contracts in 10-20 loans made to companies with private ownership of 40% or less. This guarantee program shall have the following features:

- Partial loan coverage - guarantees will be provided for only a part of total loans (e.g., maximum coverage of 50-75% of loans) and shall be limited to a total maximum amount (e.g., $50,000-$100,000)
- Performance contracting - guarantees shall be reimbursable only in the event of failure to provide promised savings under guaranteed-savings, performance contracts. Guarantees will not be used to insure other elements of lending risk (e.g., borrower default because of bankruptcy or unwillingness to repay loans or energy service company failure to install all measures).
- Partial funding by GEF - other lending Egyptian, private, or multilateral institutions will provide a portion of the funds needed for guarantees. Activities under this output will be directed towards retaining the cooperation of these other entities.
- Loan provision by parties other than GEF - the loans guaranteed under this program may be provided by private or public Egyptian banks or by international commercial banks.

The precise specification of this program will depend upon financial conditions at the time of program execution. Work now being done by USAID/ECEP or other agencies may influence these precise specifications. Part of the activities below will help to define the precise specifications for this partial loan guarantee program.

This pilot program will directly create a 20% electricity and thermal energy use reduction by 10-20 medium- to large- firms.[4] This output will thus help reduce electricity sales by 750-1,500 GWh/year (187,500-375,000 TOE) and CO_2 emissions by about 500-1,000 thousand tons/year. By encouraging its replication to other programs and providing support to performance contract-based loans to other partially private firms, this pilot program should lead to electricity savings of 2-3 times this amount. In total then, it is estimated that this program could therefore reduce CO_2 emissions by about 1.55 million tons/year.

EEA shall be the agency responsible for executing activities for this output, through the direction of the Business and Finance Work Group and the Project Technical Director.

Activities for Output 1.5

1.5.1 Develop program specifications:

- number of public sector enterprises to receive guarantees (should range from 3-5; size needs to be large enough to encourage risk-pooling among the projects but not so large as to jeopardize loan guarantee funds)
- maximum guarantee sizes
- financial terms
- security evaluation procedures (e.g., performance contracting, due diligence procedures)
- eligibility requirements (e.g., bill paying record and credit history, facility size, energy efficiency needs)
- ideal end-use customer credit and other characteristics (e.g., partially privatized firm scheduled for further privatization, credit-worthy but not so profitable as to preclude the need for assistance)
- guarantee repayment mechanisms (e.g., letter of credit, collection through utility bills)

1.5.2 Prepare a formal solicitation for participation by industries. Develop evaluation guidelines. Prepare and release a solicitation for pilot program participation. Evaluate solicitation responses.

[4]Assumed average consumption of 75 GWh/year of electricity and 187.5 thousand tons or oil equivalent per year of thermal energy demand.

1.5.3 Administer guarantees for eligible participants. Evaluate performance and other contracts to be used for program electricity savings measures. Execute loan due diligence, retaining outside consultants as needed, especially in the area of technical performance evaluations.[5] Make formal decisions on financing applications. Prepare guarantee documents.

1.5.4 Monitor guarantee and program performance. Develop guarantee monitoring procedures. Assess performance of individual loans. Assess electricity savings for measures installed.

1.5.5 Prepare reports on the program's costs and benefits, drawing conclusions from the program's experience, and providing guidance so that other programs can replicate this program's success.

IMMEDIATE OBJECTIVE 2: ENERGY EFFICIENCY STANDARDS FOR NEW EQUIPMENT

To develop energy efficiency standards and labeling for two classes of major energy-consuming equipment, that will be fully supported by the GOE, and implemented prior to the end of the project by one or more organizations.

Success Criteria

- Energy efficiency standards will be adopted for two classes of electrical or thermal energy equipment;
- There will be local manufacturing capabilities for equipment that is in compliance with the standards;
- Promotional efforts will ensure that consumers are well advised to seek out equipment that meets or exceeds energy efficiency standards.

Context

There are no energy efficiency equipment or appliance standards in Egypt. Most equipment manufactured in-country has relatively low energy efficiency. Imported equipment (whether highly energy efficient or not) is subject to import duties at varying levels. The only standards for equipment pertain to health, safety, or physical/electrical technical compatibility. In keeping with the country's economic liberalization and plans

[5]DRTPC currently performs such evaluations

for privatization of industry, the GOE and its Egyptian Organization for Standards have displayed no initiative to adopt any non-essential technical standards. The energy constituencies of EEA and OECP have not formally advised the government to initiate activities for energy efficiency standards.

Yet, it is clear that substantial energy saving opportunities and environmental benefits can occur from improving the energy efficiency of the most wide-spread and energy-consuming appliances and equipment. The suggested GEF project objective is to establish energy standards that could be accomplished first on a voluntary basis with public promotion. This provides time for manufacturers to assess market demand and to make necessary adjustments to product lines and production equipment. It also allows time for implementation details such as equipment testing, labeling systems, and promotional activities to be worked out. During this period public promotion can encourage consumers and industries to purchase new equipment that meets or even exceeds these energy standards.

A voluntary standard can be administered in either a technical way (e.g. giving absolute scores of efficiency from 70-100 percent, coefficient of performance, or estimated energy use per hour) or in a user-friendly fashion (a good, better, best system; or a 2-star, 3-star, 4-star system). The latter system is often called a "quality mark" system in Egypt. One or another system may be best depending on the class of equipment, and the type of buyer (e.g. consumer or industrial). These determinations should be made according to the activity plans outlined below.

After a few years of experience, it will be apparent if market forces have driven manufacturers to produce more efficient models (as has been the case in some countries). This is commonly referred to as "market transformation". The GOE can make this assessment and determine if voluntary standards are effective, or if mandatory standards are dictated to ensure more widespread adoption. If the latter is the case, the GOE should adopt these standards on a mandatory basis. In such a case, OECP and EEA must work cooperatively to ensure a mandatory standard is implemented.

This objective will be met through the following seven outputs:

Output 2.1	Target classes of equipment that offer substantial energy efficiency potential.
Output 2.2	Two well-qualified teams of experts assigned to develop standards.
Output 2.3	Minimum technical specifications for energy efficiency standards and/or a related quality mark system.
Output 2.4	A strategy and recommended plan to ensure local manufacturers will be able to produce or assemble equipment that complies with efficiency standards.

Output 2.5 Testing and certification methods and facilities for equipment subject to standards.

Output 2.6 Government adoption of cost-effective energy efficiency standard and implementation plan.

Output 2.7 Promotional plan for equipment that exceeds the minimum energy efficiency standards.

The financial and personnel inputs required to accomplish this work are summarized in Section E and presented in more detail in Annexes 1-4.

Output 2.1 Target Equipment

Target classes of equipment that offer substantial energy efficiency potential.

Activities for Output 2.1

2.1.1 Identify the primary classes of electrical and thermal equipment used in Egypt based on current estimated energy use. (See 1994 ECEP DSM Assessment, and 1994 Egyptian National Committee paper to the World Energy Congress).

2.1.2 For each class of equipment, identify the typical efficiencies of equipment now used in Egypt (both locally manufactured or assembled, and imported), using data developed by the OME project in Alexandria (performed by OECP and AEDC) for residential and commercial energy use, by OECP for industrial energy use, and assisted by data developed in USAID's ECEP program for commercial and industrial energy facilities.

2.1.3 Compile international standards (from Europe, Asia, U.S.) for the primary classes of equipment. (Two good sources of information are the research staff at the American Council for an Energy Efficient Economy as well as the International Institute for Energy Conservation, both in Washington, D.C.)

2.1.4 Compare the efficiency of international standards with the efficiency of products now available in Egypt.

Parties responsible for activities 2.1.1 - 2.1.4: OECP Energy Efficiency Equipment Manager (EEEM), assisted by AEDC, one

or more national equipment consultants, and the international equipment standards consultant.

2.1.5 Select the two most promising classes of equipment as targets for energy efficiency equipment standards. The selection should consider total energy use, the amount of energy savings possible, and the degree of uniformity in the configuration of common models of equipment. Candidate equipment classes would include: electric motors, lighting, refrigerators, and air conditioning; as well as thermal equipment for combustion controls and steam system components.

Note: if the efficiency of certain industrial equipment is heavily dependent on specific site applications, this equipment should not be selected for developing an efficiency standard.

Parties responsible for activity 2.1.5: The OECP Senior Project Manager (OSPM) and EEEM, in consultation with the EOS, will make a recommendation for target equipment first to the Project Advisory Council (PAC) members, and then to the High Level Coordination Committee (HLCC). The consensus of both the PAC and the HLCC should guide the work activities for Outputs 2.2-2.7.

Output 2.2 Standards Development Teams

Two well-qualified teams of experts assigned to develop standards.

Activities for Output 2.2

2.2.1 Appoint a work group for each of the two chosen equipment classes for which standards will be developed. Each working group should consist of four committees:
1) technical standard development
2) local manufacturing capability and development needs
3) testing, certification and labeling requirements
4) promotion of consumer response

The work groups will be comprised of project staff and national consultants. For each class of equipment, two national consultants must be assigned to each of the committees 1-3, and one consultant should be assigned to the consumer response committee. Due to possible similarities

in issues, it may be more efficient to have the work of committees 3 and 4 performed by the same individuals for both equipment classes.

Parties responsible for activity 2.2.1: The OSPM shall appoint the working groups in consultation with the PAC and the EOS. Staff and national consultant members of the work groups shall include representatives of manufacturers, the engineering syndicate, energy efficiency experts, consumers, university or research institute experts, testing facilities, and standards specialists. Work will be assisted by one or more national and international consultants.

2.2.2 Carry out three study tours to gain first hand information and understanding of how standards were adopted and implemented in representative countries. Study tours should include a 7-day tour to the U.S., a 3-day tour to learn of the upcoming European appliance efficiency standards, and a 10-day combined tour to Japan and South Korea. Each tour should include two representatives of each of the four committees, plus the EEEM and energy efficiency equipment specialist (EEES), for a total of ten. The individual members of each work group should rotate their participation across the three tours to allow most members to gain some exposure to international experiences.

Parties responsible for organizing the study tour are the OSPM and EEEM, assisted by the national equipment consultants, with input from the international equipment standards consultant.

Output 2.3 Technical Specifications for Energy Efficiency

Minimum technical specifications for energy efficiency standards and/or a related quality mark system.

Activities for Output 2.3

2.3.1 Committee members and other interested members of the equipment work group will participate in a one-week training course that gives an overview of the technological efficiencies available for common classes of energy-consuming equipment. This training will use an international consultant as the instructor, who will spend a second week in residency for meetings and attention to other standards issues facing work group members and their assigned activities.

Parties responsible for this activity are the EEEM as the organizer, with course material developed by an international consultant for equipment standards.

2.3.2 The technical standard development committee will identify alternative technological improvements that can increase the energy efficiency of the selected equipment for Egypt.

2.3.3 Based on input from manufacturers (see activity 2.4.2), the manufacturing committee will estimate changes in production costs for the equipment for different degrees of efficiency improvements.

2.3.4 The technical standard and manufacturing committees will reach a consensus on the best combination of efficiency improvements relative to production cost increases. Any concerns about the ability of consumers or industries to afford any associated price increases in equipment meeting the standards should be referred to the committee on promotion of consumer response, and to the GEF/UNDP Project Technical Director for possible referral to the working group for Component 2, Objective 1 regarding financing mechanisms to promote and support energy conservation. This activity should also identify costs to implement the standard, and recommend a plan to allocate these costs.

Parties responsible for output 2.3 will be those identified in activity 2.2.1.

Output 2.4 Local Manufacturing Capacity

A strategy and recommended plan to ensure local manufacturers will be able to produce or assemble equipment that complies with efficiency standards.

Activities for Output 2.4

2.4.1 Hold discussions with the major local manufacturers of the target equipment to identify the extent to which they would need new product designs and production technology to produce higher efficiency products.

2.4.2 Estimate the likely costs for new product design, new technology licenses from foreign partners, production line re-tooling costs, and

associated lead times needed to comply with the standards under discussion.

2.4.3 Investigate possible support strategies that could help local manufacturers with the transition effort to adopt energy efficient technology (examples: facilitating access to foreign technology licenses, or government or power sector cost-sharing of re-tooling costs for production lines and product designs if the cost-effectiveness analysis [see activity 2.6.1] proves this to be lower cost than new generation investments, as is the case in Thailand).

2.4.4 Develop a recommended plan to realistically facilitate local manufacture of complying equipment.

Parties responsible for output 2.4 will be those identified in activity 2.2.1, assisted by the national and international manufacturing business consultants.

Output 2.5 Testing and Certification Methods and Facilities

Testing and certification methods and facilities for equipment subject to standards.

Activities for Output 2.5

2.5.1 Testing, certification and labeling committee members and other interested members of the equipment work group will participate in a one-week training course that gives an overview of testing and certification procedures used by other countries having energy efficient equipment standards. Course content will include testing equipment, procedures, types of organizations that should perform testing, and means to support the financial cost of testing and certification. These will apply to the classes of energy-consuming equipment selected for Egypt's target. This class will use an international consultant as the instructor, who will spend a second week in residency for meetings and attention to more specific issues facing work group members and their activities.

Parties responsible for this activity are the EEEM and EEES as the organizers, with course material developed by an international consultant for equipment standard testing and certification procedures.

2.5.2 Identify the methods and test conditions to be used to test the energy efficiency performance of the selected equipment. These may include international testing standards, or standards specifically applicable for conditions in Egypt.

2.5.3 Identify test facilities, both in Egypt and internationally, that can be used to verify efficiency. For existing Egyptian facilities, identify the operator, equipment available, and the exact tests that can be performed. For example, some testing facilities operate under the jurisdiction of the EOS, and others under NREA/EREDO.

2.5.4 Determine the method of passing and reporting qualifying equipment, such as:

a. a minimum "floor" score that simply designates that equipment "passed",
b. an absolute numerical score (such as 70% is passing, but scores can be 70, 73, 85. etc.), or
c. ranges of passing scores (such as 70-79 = good, 80-89 = very good, 90+ = excellent).

2.5.5 Decide upon a verification system, which could include manufacturers' submission of equipment to independent testing facilities, or government testing of random equipment models selected from manufacturers' production lines. Determine a funding mechanisms for the anticipated testing costs (e.g. costs charged to manufacturers whose equipment is tested).

2.5.6 Decide upon a labeling system to report the energy efficiency of the equipment to potential industrial buyers or consumers. Manufacturers should be responsible for attaching secure labels to the equipment.

Parties responsible for output 2.5 will be those identified in activity 2.2.1.

SECTION D
Component 2

Output 2.6 GOE Adoption of Cost-Effective Standards

Government adoption of cost-effective energy efficiency standard and implementation plan.

Activities for Output 2.6

2.6.1 Conduct a cost-effectiveness analysis of the proposed standard, and report the short- and long-term costs and benefits to each of the following affected parties:

a. manufacturers
b. equipment owners/users
c. energy suppliers (power sector, oil and gas suppliers)
d. government (if gov't cost-sharing is involved)
e. national economy.

Include consideration of all costs likely to be incurred with implementation, through an assessment of the proposed cost allocation scheme.

The party responsible for this activity is the EEEM, under the direction of the OECP SPM, and assisted by staff of OECP, EEA, EGPC, and a national economic consultant. The economic analysis may be performed by an OECP or EEA staff economist, or a national economic consultant working with the equipment standards and building code work groups.

2.6.2 The consensus of the work group and its committees will be submitted to the GOE with a recommendation to adopt the proposed standards or quality mark system. This recommendation will include an implementation plan. Recommendations will be presented to the Minister of Electricity, Minister of Industry, and President of the EOS for their consideration and adoption.
Note: If public sector companies manufacture a significant portion of the covered equipment, the Minister of Public Enterprise shall also receive the recommendations, and be included in the joint ministerial committee cited below.

Party responsible: OSPM and EEEM will be responsible for submitting the recommendations on behalf of the work group.

2.6.3 A joint ministerial committee of the Minister of Electricity & Energy and the Minister of Industry, in consultation with the President of EOS and the Chairman of OECP, will consider the

proposed standard and will meet with representatives of the work group to review any questions. Unresolved issues will be returned to the work group or its committees for resolution, and subsequent review and approval of the joint ministerial committee.

Parties responsible: The Minister of Electricity & Energy and the Minister of Industry, in consultation with OECP and the President of EOS.

2.6.4 A joint ministerial committee adopts the standard and authorizes implementation by designated parties, as specified in the implementation plan identified in activity 2.6.2.

Parties responsible: Minister of Electricity and Energy and Minister of Industry adopt the standards, and turn over for implementation to the organizations identified by the implementation plan.

Output 2.7 Promotion of Equipment that Exceeds Standards

Promotional plan for equipment that exceeds the minimum energy efficiency standards.

Activities for Output 2.7

2.7.1 Consumer response committee members and other interested members of the Equipment work group will participate in a one-week training course that gives an overview of consumer labeling mechanisms, associated promotional activities, and the experiences with customer response in other countries having energy efficient equipment standards. Examples will draw from a range of international experiences, with particular attention to the classes of energy-consuming equipment selected for Egypt's target. This class will use an international consultant as the instructor, who will spend a second week in residency for meetings and attention to individual issues.

Parties responsible for this activity are the EEEM, EEES, and Education Specialist, with course material on labeling and buyer promotion developed by an international consultant for equipment standards.

2.7.2 Conduct a market assessment to consider:

a. the type of rating system that will work best for the buyers of target equipment
b. the need for buyer financing, leasing, or other incentives to manage the potentially higher first cost of energy efficiency equipment models.

Parties responsible: The OSPM and EEEM will arrange a subcontract for the market research activity.

2.7.3 Design promotion and education campaigns to target audiences (industry, business, consumers) to explain and promote consideration of energy efficiency ratings or labels when buying new products. Promotion should include mention of the environmental benefits. Identify appropriate parties to conduct these campaigns.

Party responsible: The work group assigned in activity 2.2.1, under the direction of the EEEM, will perform this task, assisted by a national consumer communication consultant.

2.7.4 Administer promotional campaigns in support of the adopted standards.

Parties responsible: the parties that will to be named by the output of activity 2.7.3. Note that it is assumed the GOE will take responsibilities for full-scale implementation of a mandatory program, and/or arrange industry-supported promotion of a voluntary standard.

IMMEDIATE OBJECTIVE 3: ENERGY EFFICIENT DESIGN AND CONSTRUCTION FOR NEW BUILDINGS

To develop and apply a voluntary professional code of practice for energy efficient design in newly-constructed residential and commercial buildings, to be later adopted as a mandatory standard. The professional code of practice is a set of technical design guidelines that, if followed, ensure a building has been designed to achieve energy efficiency. Initial efforts will concentrate on Cairo and Alexandria, where 50% of all the country's construction occurs. Voluntary implementation should commence by the year 2000. A plan will be developed for enforcement of a mandatory standard by the year 2001 or 2002. Non-renewable energy use in new residential and commercial buildings covered by the code will be reduced by an estimated 20%.

SECTION D
Component 2

Success Criteria

- Development of an energy efficiency code of practice for new buildings;
- Awareness of this code of practice among architects, engineers and construction companies responsible for half the new building in Cairo and Alexandria;
- Exposure of approximately 20% of architects, engineers, and construction company supervisors in the Cairo and Alexandria areas to energy efficient building design training or technical guidelines;
- Awareness of the concept of energy-efficient building design principles and their benefits by 33% of the major owners and developers of new buildings, to encourage them to seek energy -efficient design when hiring building designers;
- Capability in Cairo and Alexandria by either city building permit staff, or specialized consultants, to review proposed architectural/ engineering plans for new commercial buildings and determine their compliance with the energy efficiency code of practice;
- A plan for implementation and enforcement of a mandatory code for energy efficiency in new buildings.

Context

As was discussed in Section A4, there are no energy efficiency standards for building construction in Egypt; only health and safety standards exist, which are not well-enforced. A regulation was adopted in 1987 requiring the installation of solar water heaters for all residential buildings in new communities. This regulation has met with mixed success, largely due to insufficient attention to implementation procedures, equipment performance testing, and quality control over installation practices. The Building Research Center currently conducts research and analysis of climate-appropriate building design, and OECP has initiated a Green Architecture program to promote the concept of climate-appropriate building design. However, there is little evidence that building design seeks to reduce the energy requirements of new buildings.

To ensure the perspective of energy savings is maintained, primary responsibility for leadership of the work under this objective is assigned to OECP, through its Senior Project Manager (OSPM). Most of the technical work will be performed by the Building Research Center, other work group members, and consultants. The emphasis on energy saving may bound some of the work activities to exclude aspects of climatically-appropriate design if there is no expectation of saving electricity.

This objective will be met through the following outputs:

SECTION D
Component 2

Output 3.1 A voluntary code of practice for energy efficiency in the design and construction of new buildings that can reduce energy requirements by 50% compared to typical new building construction.

Output 3.2 Training materials and technical tools to assist building designers, builders, and building permit officials to apply the energy code.

Output 3.3 Awareness promotion of the voluntary code of practice to increase adoption by designers, owners, and builders.

Output 3.4 An implementation, compliance and enforcement plan for a mandatory code.

Output 3.1 Code of Practice

A code of practice for energy efficiency in the design and construction of new buildings.

3.1.1 Identify, obtain, and summarize information on both typical and state-of-the art building designs and their energy requirements in hot, arid climates around the world. Identify energy-efficient building designs, costs, and energy savings. Examples should include Tunisia, Morocco, and Israel.

Party responsible for activity is the Energy Efficient Building Manager (EEBM), assisted by Building Research Center (BRC) Energy-Efficient Building Research Analysts (EEBRAs) and national consultants.

3.1.2 Perform energy analysis of sample of 5-10 typical new building designs in Cairo and Alexandria. Select both residential and commercial buildings in low-rise and high-rise configurations. Compare these buildings' energy performance to typical and best-case buildings being designed in Tunisia, Morocco, and Israel. Identify possible energy design improvements. Analysis will be supported by training for the building energy analysis software tool "Visual DOE", a user friendly version of the DOE-2 building energy analysis tool. Training will include development of analysis report formats for use in the project.

Parties responsible for activity are EEBM and Building Design Consultant, supported by EEBRAs. Energy analysis software training will be performed by an international instructor, with assistance by research staff from BRC.

3.1.3 Perform on-paper analysis to develop improved designs for the same 5-10 buildings and model the possible energy savings. Build a list of all possible design improvements, and identify the expected energy savings and construction costs for each improvement.

Parties responsible for activity are same as 3.1.2, with addition of selected national and international consultants.

3.1.4 Using the information from 3.1.1 - 3.1.3, identify the best opportunities in Cairo and Alexandria for reducing energy requirements at reasonable cost. For the 5-10 sample Cairo and Alexandria buildings, identify the likely energy savings and costs from the following classes of energy design improvements:

a. building design relative to site (considering climate differences between the two cities)
b. electrical equipment (lighting, air conditioning, elevator motors, solar DHW)
c. wall materials (insulation, glazing, exterior shading, wall materials)
d. modeling whole-building energy performance

Party responsible for activity is OSPM and EEBM, assisted by the EEBRAs.

3.1.5 Select the most promising area(s) with consideration of expected energy savings for different building types, amount of new construction for different building types, likely construction cost for energy efficiency features, and project budget funds available.

Parties responsible for activity are the OSPM, assisted by the EEBM and EEBRAs. Recommendation will be made to Project Technical Director (PTD) and Project Advisory Council.

3.1.6 Assign a work group(s) to develop a proposed set of building practice or codes for the most promising areas and building types.

Parties responsible for activity are OSPM and EEBM, in consultation with the PTD. Work group should draw its

representatives from such organizations as BRC, university faculty members in architecture and engineering, professional architects and engineers, union for contractors, manufacturers of building materials, OECP Green Architecture staff member, NREA and EEA.

3.1.7 Conduct a local training program for work groups and other interested professionals on the international experience with building codes of practice and mandatory standards for energy efficiency. Training curriculum should address:
a. design features and technical issues of energy efficient buildings
b. strategy used for types of buildings targeted, levels or degree of efficiency, and expected compliance
c. implementation experience, including training, support tools, promotion and enforcement, and labor skills required.

Party responsible for activity is the EEBM, in consultation with members of the work group, and performed by selected national and international consultants.

3.1.8 Arrange and conduct two international study tours for the work group(s) to selected countries to gain first-hand exposure to understand the same issues as those listed in 3.1.6. Destinations for the first trip are in the Mediterranean area and should include traditional and new Egyptian villages, and two of the following: Tunisia, Morocco and Israel in MENA. The second trip should include two of the following countries: Pakistan, Thailand, and Australia.

Party responsible for activity is the EEBM for planning, with execution by the OECP Chairman, with support in from UN DESA.

3.1.9 Develop technical specifications for a draft code of practice without full assessment of construction and cost impacts for energy efficiency in selected building types, possibly with alternatives for the degree of efficiency that could be achieved. The selected scope of the code might consider residential and/or commercial buildings, minimum size, most common styles, and/or target systems (for example, walls, glazing, air conditioning, and lighting). To save time and leverage other knowledge, the work

group should consider borrowing from other countries' standards, and modifying them as needed for the local conditions in Egypt.

Party responsible for activity is the EEBM and the work group, under the oversight of the OSPM. Assistance will be provided by the National Building Design Consultant and International Building Codes Consultant.

3.1.10 Hold discussions with building companies, building material suppliers, and designers to estimate the capabilities of the local construction supervision and trades labor force to apply the construction techniques needed to comply with the energy code. Estimate the requirements and costs for any improvements in skills or use of higher-skilled laborers.

Party responsible for activity is the EEBM, assisted by the National Building Construction and Trades Consultant.

3.1.11 Conduct a cost-effectiveness analysis of the alternative code considerations with regard to the likely costs and benefits for:

a. builders
b. building owners
c. occupants or tenants (who may pay some/all energy bills)
d. energy suppliers (in avoiding energy supply investments)
e. the Egyptian economy as a whole.

Parties responsible for this activity are the EEBM and OSPM, assisted by the staff economist, and national resource economist.

3.1.12 Prepare a final code of practice for energy efficiency in new buildings that achieves the best balance of costs and benefits.

Party responsible for activity is the EEBM, in consultation with the work group.

Output 3.2 Training and Support Materials

Development of training and support tools for voluntary code adoption by building designers, builders, and those who issue building permits. Materials also will be used for Outputs 3.3 and 3.4.

3.2.1 Develop guidebooks on how to meet the code of practice, including how-to manuals, suggestions on software tools, example design solutions (for example for thermal envelope, model lighting designs, guidelines on sizing and choosing air conditioning systems matched to the building design and thermal load).

Party responsible for activity is EEBM, assisted by work group members, Education Specialist, national consultant, international consultant, and building code consultant.

3.2.2 Develop a 10-15 minute videotape that introduces the subject of energy efficient design that can be shown at seminars, trade shows, and professional meetings.

Parties responsible for activity are EEBM, Education Specialist, and work group consultants.

3.2.3 Publish results of the sample building analysis and re-design that was performed in Activities 3.1.2 and 3.1.3.

Parties responsible for activity are EEBM and EEBRAs, and national consultant in building design.

3.2.4 Develop master sets of training materials (curriculum, teaching objectives, transparencies, lecture notes) that can be used by researchers, professionals and university professors in both professional and university training programs.

Party responsible for activity is EEBM, assisted by work group members, and national building design and building construction and trades consultants.

Output 3.3 Voluntary Code Promotion

Promotion of the code of practice and dissemination of information to designers, owners, and builders.

3.3.1 Prepare and place a minimum of three articles on the subject of energy efficient design and the voluntary code of practice in local professional newsletters and journals.

Parties responsible are EEBM and Education Specialist.

3.3.2 Conduct a minimum of three 3-day training programs for professional architects and engineers active in the construction business to present codes, design compliance examples, and energy analysis.

Parties responsible for activity are EEBM and work group members.

3.3.3 Promotion of a voluntary code of practice through three 1-day workshops in Cairo and Alexandria targeted at professional associations and syndicates. Identify organizations and individuals who are able to serve as a pipeline to identifying the intended and interested training audiences. Include the manufacturers and suppliers of affected building materials in the outreach and training.

Parties responsible for activity are EEBM, assisted by work group members and national consultants, and Education Specialist.

3.3.4 Sponsor a series of three country-specific visiting teams of experts (each team might have 2-3 people on the subjects of technical issues, approach to standard, and implementation experience and issues) for two week residencies to participate in training, professional forums, in-service discussions, and meetings with interested organizations and individuals. For each set of visitors, include at least one evening lecture to which professionals are invited. Use some of the same countries and individuals with whom successful contacts were made during the study tours.

Party responsible for activity is the EEBM, in coordination with work group members.

Output 3.4 Mandatory Code with Enforcement

Development of an implementation plan for making the code mandatory, and ensuring compliance or enforcement.

3.4.1 Identify alternative methods or options for implementation:
a. continued reliance on voluntary compliance

b. mandatory codes to be applied to all buildings over a certain size and enforced by local government or building permit agency
c. mandatory codes for buildings using public funds or that will be occupied by government agencies and employees.

Parties responsible for activity are EEBM and OSPM.

3.4.2 Investigate a range of possible enforcement options, such as:
a. creating professional verification based on review of plans and/or modeling
b. verifying materials used on-site
c. verifying on-site construction practices
d. applying requirements initially to larger buildings, and later to smaller buildings
e. holding designers, construction companies, materials suppliers, and/or building insurance companies professionally and financially liable for compliance with the energy code
f. considering Russia's "building energy passport", which is a voluntary mechanism that combines verification and certification of a building's design compliance with a code of practice or standard, and verification one year after occupancy of actual energy performance. This could be termed "private enforcement" of standards.

Party responsible for activity is EEBM, in consultation with legal advisor, national building construction and trades consultant, and senior representative of the Minister of Housing.

3.4.3 Prepare a plan for code adoption and implementation, and present this to the Ministry of Housing and Construction.

Parties responsible for activity are EEBM and work group members, in consultation with OSPM and PTD. Final plan is presented to Minister of Housing and Minister of Electricity & Energy

3.4.4 Adopt a GOE requirement for mandatory code enforcement in applicable buildings

Party responsible is the Minister of Housing and Construction, supported by the Minister of Electricity and Energy and the OECP Chairman.

3.4.5 Develop a plan for training and instruction of university students in architecture and engineering in energy efficient design, construction, and compliance practices.

Party responsible for activity is work group, in consultation with university faculty not on the work group.

IMMEDIATE OBJECTIVE 4: ENERGY EFFICIENCY CENTER

To facilitate the achievement of a total reduction in energy demand of 8.3% by 2010 under Objectives 1-3 of Component 2 through a four-year program to promote increased awareness of and strategic action on energy efficiency issues, both within EEA, and among energy service industry providers, equipment manufacturers, other energy industry professionals, and energy users.

EEA shall be the executing agency responsible for achieving all outputs under this objective. The Information and Promotion Work Group shall be primarily responsible for helping the Project Technical Director to execute these tasks. The Information and Promotion Work Group shall be assisted by Resource Planning Specialists. Several work groups (Auditing and Technical Services, Business and Finance, Building Codes, and Equipment Standards) shall assist in the Information and Promotion Work Group by providing results from the work under Objectives I through III of Component 2.

Success Criteria

By the end of the project, EEA will have:

- collected energy efficiency market information (e.g., customer electricity use, energy savings potential, feasibility studies, market size, energy efficiency technologies, monitoring, measurement, and verification) and developed mechanisms and procedures for distributing energy efficiency information effectively among energy service industry providers, equipment manufacturers, other energy industry professionals, and energy users.

- developed strong integrated resource planning capabilities that allow EEA to fairly evaluate the contributions of energy efficiency investments relative to traditional supply side resources, based on an objective assessment of the costs

and reliability of energy efficiency resources compared to those of supply side resources.

- begun using these integrated resource planning capabilities strategically, by initiating programs in Egypt that reduce greenhouse gas emissions while also helping to solve electricity demand and supply problems for EEA and electricity distribution companies.

Summary of Outputs

Output 4.1 Establishment of information management and dissemination capabilities to provide information on: energy efficiency industry market opportunities; energy-efficient equipment cost, reliability, and availability; energy efficiency financing; and other issues relevant to the energy services industry, to help overcome information barriers currently inhibiting the energy services industry.

Output 4.2 Establishment of information management and dissemination capabilities to help overcome barriers of customer awareness by providing information to consumers on the benefits of energy efficiency.

Output 4.3 Establishment of a country-wide energy efficiency information network consisting of a national and regional information centers to facilitate providing energy information to the energy service industry and to end-use consumers.

Output 4.4 Incorporate lessons learned on cogeneration, load management, and energy efficiency into the power sector and develop strong integrated resource planning capabilities to allow EEA to evaluate the energy efficiency options and assess strategic actions that reduce greenhouse gas emissions.

Output 4.1: Information Management and Dissemination for the Energy Services Industry

Establishment of information management and dissemination capabilities to provide information on market opportunities and energy efficiency infrastructure to the energy services industry. This service will help the energy services industry to overcome information barriers that are currently inhibiting the industry from comprehensive and methodical exploitation of market opportunities.

SECTION D
Component 2

The Information and Promotion Work Group shall be primarily responsible for achieving this output. The Auditing and Technical Services, Business and Finance, Building Codes, and Equipment Standards Work Groups shall assist the Information and Promotion Work Group by providing results from the work under Objectives 1 through 3 of Component 2.

Activities for Output 4.1

4.1.1 Assess information gaps currently inhibiting the energy services industry. Review prior studies on this issue conducted by ECEP and other programs. Conduct surveys of energy services industry to determine current level of information of which they are aware and that they use. Based upon this assessment, develop a broad strategic plan for developing and distributing this information.

4.1.2 Collect energy efficiency market and infrastructure data on:

- customer electricity use by sector and end-use technology
- energy savings potential (in part based on audits conducted for Output 1.1)
- functions, performance, and local availability of end-use energy efficiency and load management technologies
- local implementation experience and performance data for energy efficient end-use equipment
- available financing mechanisms, including those developed under ECEP

4.1.3 Assess contributions/impact of prior market studies conducted by ECEP and other programs. Prepare summary reports on the best sources of market information (market intelligence) available on Egypt's energy efficiency market.

4.1.4 Assess and synthesize information collected by EEA in Activities 4.1.2 and 4.1.3 and that received from OECP from Objective 2 and 3 outputs. Summarize key findings from this research. Develop databases and information management systems that facilitate retrieval and use of this information. Prepare reports in appropriate that are most appealing to potential service providers formats and that provide the energy services industry key information on best market opportunities in addition to business segments on which they should focus, based upon the assessment performed in Activity 4.1.1.

4.1.5 Identify optimal communication channels and information distribution mechanisms to provide access to information collected and synthesized in Activities 4.1.2 through 4.1.4. Assess channels for distributing information to public officials and energy professionals that include:

- decentralized information agents and forums throughout EEA zones (e.g., distribution companies, technical societies)
- on-line computer data bases with Internet access
- news media (e.g., television, radio, newspapers, professional publications, periodic newsletters)
- seminars and public forums in the energy services industry.

Prepare a brief report or memorandum describing the advantages and disadvantages of each information source. Describe findings and conclusions. Provide and defend recommendations for an optimal information distribution strategy.

4.1.6 Develop an energy efficiency information distribution strategy that considers the above information sources as well as the need for energy efficiency information in various sectors of the energy services industry. Prepare schedule for information distribution.

4.1.7 Distribute information collected, assessed, and compiled in the above activities through optimal channels and distribution strategies identified above.

4.1.8 **Assess the effectiveness of information management program.** Survey the energy services industry about the effectiveness of information outreach program in terms of expanding business opportunities and promoting energy efficiency. Develop procedures for modifying information collection, assessment, synthesis, reporting, and distribution efforts on an annual basis.

Output 4.2: **Information Management and Dissemination for Energy End Users**

Establishment of information management and dissemination capabilities to provide information to consumers on the benefits of energy efficiency. This program will help overcome barriers of customer awareness that are currently inhibiting consumers from adopting economic energy efficiency measures.

SECTION D
Component 2

The Information and Promotion Work Group shall be primarily responsible for achieving this output. The Auditing and Technical Services, Business and Finance, Building Codes, and Equipment Standards Work Groups shall assist in the Information and Promotion Work Group by providing results from the work under Objectives 1 through 3 of Component 2.

Activities for Output 4.2

4.2.1 Assess state of information among consumers and identify information gaps that are currently inhibiting consumers from adopting energy efficiency measures. Review prior studies on this issue conducted by ECEP and other programs. Interview energy services industry participants (service providers) about their assessment of key information gaps. Conduct follow-up surveys of energy consumers to verify and update prior studies and to better determine how information gaps are inhibiting greater adoption of energy efficiency measures. Based upon this assessment, develop a broad strategic plan for developing and distributing this information.

4.2.2 Collect energy efficiency data on energy savings potential based in part upon audits conducted for Output 1.1. This data will include estimates of the energy and monetary savings of efficiency thermal and electricity-use technologies compared to the current state of energy efficiency in Egypt.

4.2.3 Assess and synthesize information collected in Activity 4.2.2. Summarize key findings from this research. Develop databases and information management systems that facilitate retrieval and use of this information by consumers. Prepare reports in appropriate formats that are appealing to end-users and that provide consumers key information that may influence them to adopt energy efficiency measures.

4.2.4 Identify optimal communication channels and information distribution mechanisms to provide access to information collected and synthesized in Activities 4.1.2 and 4.1.3. Assess channels for distributing information to energy consumers that include:

- decentralized information agents and forums throughout EEA zones (e.g., distribution companies, local organizations)
- on-line computer data bases with Internet access
- news media (e.g., television, radio, newspapers, professional publications, periodic newsletters).

Prepare a brief report or memorandum describing the advantages and disadvantages of each information source. Describe findings and conclusions. Provide and defend recommendations for an optimal information distribution strategy.

4.2.5 Develop an energy efficiency information distribution strategy. Prepare a schedule for information distribution.

4.2.6 Distribute information collected, assessed, and compiled in Activities 4.1.2 and 4.1.3 through the optimal channels and distribution strategies identified above.

4.2.7 Assess effectiveness of information management program. Survey the energy services industry about the effectiveness of information outreach program in terms of expanding business opportunities and promoting energy efficiency. Develop procedures for modifying information collection, assessment, synthesis, reporting, and distribution efforts on an annual basis.

Output 4.3: Establishment of National and Regional Information Centers

Establishment of a country-wide energy efficiency information network consisting of a national and regional information centers. This output will facilitate providing energy information to the energy service industry and to end-use consumers and will thereby help overcome information barriers currently inhibiting greater energy efficiency in Egypt. The centers will also work with other national energy counterparts and stakeholders such as OECP, DTPRC and TIMS to ensure information exchange and dissemination. The national center will be situated at EEA.

The Information and Promotion Work Group shall be responsible for achieving this output.

SECTION D
Component 2

Activities for 4.3

4.3.1 Assess the appropriate balance of central and regional data sources. Assess the availability of information at national and regional levels and identify information gaps. Evaluate consumers' willingness and likelihood of using information on a national and regional level. Prepare summary brief recommending an overall strategy and direction for the establishment of central and regional information sources.

4.3.2 Establish a national energy information center. Evaluate the benefits of establishing a center at EEA headquarters versus contributing to a joint National Information Center with OECP and other organizations. Identify key information sources to be located at the center based on sources acquired for Outputs 4.1 and 4.2. Acquire information management and other infrastructure needed for a national center, including computers, copiers, printers, information organization systems, accounting, payroll, and other overhead systems. Recruit and retain staff. Perform training.

4.3.3 **Establish regional information centers. In each of the EDC regions,** assess the relative capabilities of EDCs versus that of energy service organizations. Evaluate information needs by EDCs and energy service industry participants in each region. Identify key information sources to be located at each regional office from those sources acquired for Outputs 4.1 and 4.2. Acquire information management and other infrastructure needed for a national center. Develop cost-sharing among national and regional centers. Develop monitoring and liaison procedures between EEA and regional centers.

4.3.4 Establish monitoring and oversight for both national and regional centers. Develop procedures for changing center procedures as needed.

4.3.4 Establish a sustainable Energy Efficiency information exchange mechanism with other energy sector players and stakeholders, such as OECP, DTPRC and TIMS.

SECTION D
Component 2

Output 4.4: Strategic Energy Efficiency Planning

Incorporate lessons learned on cogeneration, load management, and energy efficiency into the power sector. Develop strong integrated resource planning capabilities that allow EEA to evaluate the results, lessons, and activities of the GEF project and those of parallel efforts. Use these capabilities to take strategic action to reduce greenhouse gas emissions while simultaneously help EEA, EDCs, and other energy providers to solve their energy planning problems.

The Information and Promotion Work Group and Resource Planning Specialists shall be responsible for achieving this output. They shall be assisted by international consultants specializing in integrated resource planning and demand-side-management.

Activities for Output 4

4.4.1 Develop data sets and information base for evaluate energy efficiency resource options on a level playing field to supply side options.

4.4.2 Assess impact of equipment standards and building codes on EEA energy supply forecast.

4.4.3 Conduct a new integrated resource plan using revised data sets and forecast assumptions.

4.4.4 Identify economics of energy efficiency, cogeneration, and other options to EEAs and EDCs.

4.4.5 Use methodologies, tools, and models developed to evaluate potential energy efficiency programs such as the residential CFL program (Output 1.4) to demonstrate how such programs can economically help EEA by solving its peak demand problems, EDCs by reducing unprofitable and subsidized sales to residential customers, and the global environment by reducing greenhouse gas emissions.

4.4.6 Use the methodologies and tools developed in Activity 4.4.1 and 4.4.3 to assess the effects of tax and other incentive programs on energy efficiency.

4.4.7 Use methodologies and data developed in Activities 4.4.1 and 4.4.3 to perform an assesment that will provide arguments for a stronger

role for eneryg efficiency in Egypt's National Energy Strategy (e.g. on issues such as cogeneration policy, wholesale tariff design for EDCs, and EEA's cost sharing program to provide incentives to EDCs and other parties to implement energy efficiency programs).

SECTION D
Component 3

Section D: IMMEDIATE OBJECTIVES, OUTPUTS AND ACTIVITIES

Component 3: Cogenerated Power

Immediate Objectives:

1. Establish a Small Power Group within EEA.
2. Establish safety and interconnection requirements for parallel grid connections with small producers.
3. Create an infrastructure for EEA to purchase electricity from small producers.
4. Establish and develop materials for a customer (small producer) training program.
5. Develop industrial cogeneration and agricultural waste projects for small power production.

Improvement Targets (by the year 2010)

Objective 5 1000 MW of generating capacity from cogeneration and renewable energy sources connected to the UPS.

IMMEDIATE OBJECTIVE 1: ESTABLISH EEA SMALL POWER GROUP ESTABLISHED AND TRAINED

To establish and train a Small Power Group within EEA Planning Studies and Design Sector.

Party responsible for Objective 1 is the Studies, Design and Planning Directorate of EEA.

Success Criteria

by the end of the project, the Small Power Group will have been staffed and have undertaken a tour of small power, cogeneration, and alternative energy sites, and completed a training program in alternative energy, cogeneration, and interconnection procedures for small power parallel grid connection;

- by the end of the project, the Small Power Group will be available to provide information and to service potential small power producers who wish to connect in parallel with the UPS.

This objective will be met through the following output:

SECTION D
Component 3

Output 1.1 **An Operational Small Power Group within EEA's Planning Studies and Design Sector**

Establishment of the Small Power Group.

Activities for Output 1.1

The Small Power Group will be multidisciplinary. The staff will have individual specialties but will be chosen on the basis of broader interest and experience in related fields. The staff will be trained as a group in all aspects of small power systems: fuels, engines, steam generation, turbines, waste heat recovery, alternative energy, synchronization, instrumentation, control systems, metering, distribution, grid interconnection, and safety.

1.1.1 Obtain approval from the Central Agency for Organization and Administration for creation of the required EEA staff positions for the Small Power Group.

1.1.2 Assemble and hire staff for the Small Power Group, to include: (1) Director of Small Power; (2) Chief Electrical Engineer, (3) Instrumentation and Control Engineer; (4) Mechanical Engineer (engine/generator systems); (5) Mechanical Engineer (combustion/steam turbine systems); and (6) Business and finance specialist.

1.1.3 Conduct staff training. Assess available small power and cogeneration training resources available within Egypt (Cairo university, TIMS), from donors, or solicit through international tender. The training program will include a "trainer training" component to train the Small Power Group staff to deliver an abridged version of its own training program to other trainees in Egypt from the Zones, EDCs and from potential small power producers.

1.1.4 As part of the training program, or as a separate training experience, the Small Power Group will visit small power, cogeneration, and alternative energy installations in metropolitan countries and in developing countries. The tour program will include the review of tariff structures and power purchase agreements in each location. Key decision makers in the

government energy establishment will be invited to participate in the tour.

IMMEDIATE OBJECTIVE 2: PARALLEL GRID CONNECTION REQUIREMENTS ESTABLISHED

To establish safety standards and interconnection requirements for parallel grid connections with small producers.

Party responsible for Objective 2 is the Small Power Group.

Success Criteria

- by the end of the project, the Small Power Group will have developed all technical specifications for safety relays and contactors, transformers, metering, electrical standards, synchronization parameters, and physical requirements for local grid connection to existing distribution lines or to dedicated feeders;

- by the end of the project, the Small Power Group will have established liaison with counterparts in the Zones and the EDCs and in mutual agreement shall have assigned responsibilities for delivery of customer services associated with system sizing and design, electrical requirements and interconnection, tariffs and economic analysis, safety and fault detection, legal issues and power purchase agreements.

- by the end of the project, the Small Power Group will have disseminated the specifications and requirements for small power connections to the Zones and the EDCs.

This objective will be met through the following three outputs:

Output 2.1 Specification document (manual) for small power grid interconnection.
Output 2.2 Framework for coordination with Zones and EDCs regarding training and documentation.
Output 2.3 Framework for coordination in delivery of customer service.

Output 2.1 Manual for Small Power Grid Interconnection

Specification document (manual) for small power grid interconnection.

Activities for Output 2.1

Preparation and assembly of an official EEA document, specifying the equipment requirements, costs, and responsibilities in establishing a grid connection.

2.1.1 Assemble equipment specifications for safety relays and contactors. Relay specifications to be based on customary international standards for over/under voltage, over/under frequency, over current, reverse power, ground fault and neutral currents, and phase imbalance.

2.1.2 Assemble equipment specifications for grid transformers.

2.1.3 Assemble equipment specifications for meters, including specification of calibration procedures and responsibility.

2.1.4 Assemble equipment specifications for grid station feeders for both delivering and receiving power.

2.1.5 Assemble specifications for local transmission line connections from small power plant to grid station.

2.1.6 Assemble specifications for synchronization panels, manual and automatic, and requirements for engine and turbine governors.

2.1.7 Prepare an instructional guideline for grid interconnection, with reference to above equipment specifications, lists of acceptable suppliers, and complete with detailed one-line diagrams for several types of grid interconnections and several types of small power systems generating at various voltages. All instructional materials to be prepared in Arabic, and available in hardcopy and software versions.

2.1.8 The materials assembled in Activity 2.1.7 will be disseminated to Zones, EDCs, and government energy organizations.

Output 2.2 Framework for Zones and EDC Training and Documentation

A framework for coordination with Zones and EDCs regarding training and documentation.

Activities for Output 2.2

All instructional guidelines and technical documentation will be made available to the Zones and EDCs.

2.2.1 Circulate all instructional guidelines and technical documentation to the Zones and EDCs for review and comment before final release.

2.2.2 The Small Power Group will establish counterpart links with the Zones and EDCs, and arrange to exchange technical information and instructional materials.

2.2.3 The Small Power Group will provide training for Zone and EDC personnel regarding interconnection and an introduction to small power generation.

Output 2.3 Framework for Delivery of Customer Service

A framework for coordination in the delivery of customer service.

Activities for Output 2.3

The Small Power Group will collaborate with Zone and EDC personnel in the delivery of customer service. Such service will include guidance with respect to cogeneration system sizing and design, electrical requirements and interconnection, tariffs and economic analysis, safety and fault detection, legal issues and power purchase agreements.

2.3.1 Setup customer service procedures with each Zone and EDC. Procedures may vary from company to company depending on level of interest and technical capability. The Small Power Group will be available as technical backup for customer service activities by the Zones and EDCs.

2.3.2 The Small Power Group will maintain a combined database of all small power connections to the grid. The Zones and EDCs will forward copies of all customer service records for that purpose.

SECTION D
Component 3

IMMEDIATE OBJECTIVE 3: INFRASTRUCTURE FOR PURCHASE OF SMALL PRODUCER POWER CREATED

To create the infrastructure of tariffs and legal agreements required for EEA to purchase electricity from small producers.

Party responsible for overall coordination of Objective 3 is the Small Power Group.

Success Criteria

- by the end of the project, EEA will have developed a comprehensive tariff structure for the purchase of electricity, both capacity and energy, at various voltage levels from small producers. The tariff may include a time-of-day feature to encourage scheduling of production during the daily peak. The tariff may also include a premium associated with production based on renewable energy sources, and will take into account the sometime seasonal nature of available agricultural fuel resources.

- by the end of the project, EEA will have clarified the existing legal framework of laws in Egypt which govern the purchase of electricity from small producers, and will have undertaken such remedial steps as are necessary to enable such purchases.

  by the end of the project, EEA will have developed a model Power Purchase Agreement suitable for small producers, that will incorporate the comprehensive tariff structure, and stipulate all terms and conditions, and responsibilities of both parties with respect to safety, meter calibration, and right of inspection, etc.

This objective will be met through the following three outputs:

Output 3.1 Tariff table for purchasing power from small producers.
Output 3.2 Clarified legal framework for cogeneration.
Output 3.3 Power purchase agreement for small power producers.

Output 3.1 Tariff Table for Small Producers

Tariff table for purchasing power from small producers.

Party responsible for Output 3.1 is the Planning and Economic Studies Department, Tariff Studies Group.

SECTION D
Component 3

Activities for Output 3.1

A tariff structure will be developed for small power producers based on the avoided cost of generation. Typically, the avoided cost is based on the highest cost generation in the network which is being displaced. Various avoided cost strategies will be explored. A separate tariff will be developed for various interconnection voltages. The tariff will include portions for capacity and for energy payments, and ideally will have a time-of-day feature to encourage generation during the daily peak. In addition, a premium value will be added to the tariff when the electricity sold to the grid is based on energy derived from a renewable fuel, and the period of delivery of power shall be adjustable based on seasonal availability of the renewable fuel.

3.1.1 Establish the rationale and determine the avoided cost of generation that is appropriately applied for small power contributions to the grid.

3.1.2 Review tariffs developed elsewhere for purchasing power from small producers. (Examples of such tariffs have been developed by PLN in Indonesia, WAPDA in Pakistan, State Electricity Boards in India, etc.)

3.1.3 **Develop the basic tariff table for capacity and energy payments** at various interconnection voltages (low and medium).

3.1.4 Develop an optional time-of-day tariff feature.

3.1.5 Develop an additional incentive tariff feature to encourage the use of renewable fuels. This feature will also incorporate an adjustment based on the seasonal availability of the renewable fuel.

3.1.6 Propose tariff for government approval.

3.1.7 Notify tariff to potential cogenerators.

Output 3.2 Legal Framework Clarification for Cogeneration

A clarified legal framework for cogeneration.

Party responsible for Output 3.2 is the Studies, Design and Planning Directorate of EEA working in conjunction with the EEA Legal Advisor and the International Legal Consultant.

Activities for Output 3.2

This activity will clarify the existing legal framework which governs small power purchases of electricity from small producers, identify those points which through ambiguity or negative impact on small power purchases require additional legal clarifications or enactments, and proceed with whatever steps are required to enable implementation of a small power purchase agreement.

3.2.1 Research existing applicable law in Egypt.

3.2.2 Identify points which may stand in the way of achieving small power purchases and define necessary remedial actions.

3.2.3 Proceed with actions required to establish sound legal basis for small power purchases.

Output 3.3 Small Producer Power Purchase Agreement

Power Purchase Agreement for small power producers.

Party responsible for Output 3.3 is the Studies, Design and Planning Directorate of EEA working in conjunction with the EEA Legal Advisor and the International Legal Consultant.

Activities for Output 3.3

A model Power Purchase Agreement will be developed that is suitable for small power producers. The agreement will specify the general terms and conditions in accordance with customary legal practice in Egypt, and include by association the current tables of tariff prices and price options, and specification of all interconnection details.

3.3.1 Review Power Purchase Agreements (PPAs) developed elsewhere for purchasing power from small producers. (Examples of such PPAs have been developed by PLN in Indonesia, WAPDA in Pakistan, State Electricity Boards in India, etc.)

3.3.2 Develop a standard form Power Purchase Agreement for small power purchases consistent with the laws of Egypt, and seek required higher level approvals.

SECTION D
Component 3

IMMEDIATE OBJECTIVE 4: CUSTOMER TRAINING PROGRAM PREPARED

Prepare an introductory customer (small power producer) guidebook for small power interconnection, develop customer training materials, and establish a customer training program.

Party responsible for Objective 4 is the Small Power Group.

Success Criteria

by the end of the project, the Small Power Group will have prepared an introductory guidebook describing how to interconnect to the grid, which will include examples of interconnections, typical equipment lists and one-line electrical diagrams.

by the end of the project, the Small Power Group will have prepared training materials, including self-taught manuals and videos, as well as materials suitable for a one or two day training program, to be available to potential small power producers. The training program and training materials will deal with safety, technical, tariff, legal, and contractual issues associated with grid interconnection;

This objective will be met through the following output:

Output 4.1 A Guidebook for Grid Interconnection

A guidebook for grid interconnection and other instructional materials, and customer training program.

Activities for Output 4.1

All information required for interconnection to the grid will be organized into a customer's reference guidebook. The materials should be presented in such a way that they are suitable for individual customer use, as well as in a short training program.

4.1.1 Abstract appropriate information from the instructional and training materials previously assembled that is specifically related to customer (power producer) concerns.

4.1.2 Incorporate photographs and diagrams to make the information more understandable to less technical readers. Prepare an introductory video utilizing attractive and modern visual techniques.

4.1.3 Include examples of actual systems, costs, pitfalls, and operating experiences.

4.1.4 Include brief explanations of the tariff and PPA, with references to where complete documentation can be found.

4.1.5 Mount a short training program utilizing the instructional and training materials of one or two day duration.

IMMEDIATE OBJECTIVE 5: INDUSTRIAL COGENERATION AND AGRICULTURAL WASTE PROJECTS PROPOSED AND DEVELOPED

Development of industrial cogeneration and biomass agricultural waste resources for small power production.

Party responsible for Objective 5 is the Small Power Group.

Success Criteria

- by the end of the project, several small power and agricultural waste cogeneration projects will be in various stages of planning and development.

This objective will be met through the following two outputs:

Output 5.1 Proposals for development of small power cogeneration systems.
Output 5.2 Proposals for development of small power systems based on renewable fuel resources for self-generation and parallel operation with the grid.

Output 5.1 Proposals for Development of Small Power Cogeneration Systems

Proposals for development of small power cogeneration systems totaling approximately 100 MW of installed capacity with potential for export of 50 MW to the grid in the first year, and 200 MW with export of 100 MW to the grid in each subsequent year.

Activities for Output 5.1

Outreach to potential small power producers; technical support, planning, and financial analysis associated with several proposed small power projects

5.1.1 Identification of candidate industries or industry groups with potential for small power projects (textiles, paper, hotels and resorts, food processing, etc.), follow-up with customer information guidelines, video, etc.

5.1.2 Analysis, conceptual design, preliminary financial analyses in consultation and collaboration with individual customers to evaluate potential small power projects and proposals.

5.1.3 Evaluation of impact on network load flow, voltage stability, and loss in local transmission and distribution lines of small power connection.

5.1.4 Discussions with potential small power producers regarding tariffs and PPAs, and any unique interconnection requirements or issues.

Output 5.2 Proposals for Development of Renewable Small Power Systems

Proposals for development of small power systems based on renewable fuel resources for self-generation and parallel operation with the grid.

Activities for Output 5.2

Outreach to potential small power producers using agricultural waste biomass; technical support, planning, and financial analysis associated with several proposed small power projects

5.2.1 Identification of candidate agro-industries or agro-industry groups with potential for small power projects (cotton, rice, maize, wheat, sugar, etc.), follow-up with customer information guidelines, video, etc.

5.2.2 Analysis, conceptual design, preliminary financial analyses in consultation and collaboration with individual customers to evaluate potential small power projects and proposals.

5.2.3 Evaluation of impact on network load flow, voltage stability, and loss in local transmission and distribution lines of small power connection.

5.2.4 Discussions with potential small power producers regarding tariffs and PPAs, and any unique interconnection requirements or issues.

Section E: INPUTS

1. Government of Egypt Inputs

Facilities — In-Kind

The GOE will be responsible for providing the office space required for the project staff to perform their duties. The in-kind contribution for the rent of this space is estimated to be LE 260,000 over the course of the project.

It is estimated that the cost of the utilities for five years for the offices, including electricity and water charges, will be LE 100,000 of in-kind contributions by GOE. Telephone charges will be accounted for separately with the estimated charges of LE 80,000 paid for by the GOE in kind. In addition, GOE will provide office supplies at an estimated cost of LE 160,000. Details are shown in Table 1 in Section J.

Office space for International Consultants and local teams will be provided as well as computer systems for office use with Internet connections, communication facilities, secretarial assistance and local transport.

GOE's total estimated in-kind contribution for facilities is LE 600,000.

2. UNDP Inputs (Component 1 only)

UNDP is providing direct funding of $800,000 to provide 100% of the costs in Component 1 on loss reduction and load management. EEA will be contributing $60,000 to this component for salaries of national staff.

Personnel

For National Consultants the Government of Egypt will assign or transfer to the project the staff listed below. Such staff will be suitably qualified and experienced. The GOE will be responsible for financing the payment of salaries (given in the table below in US dollars) and allowances commensurate with current policies and future policies which may from time to time be decided by the GOE. For budget purposes, a flat total cost of US $ 500 has been used for all positions. In actuality, costs will vary across positions.

Position Title	Work Months	Total Salary Costs
International Consultants		
International Plant Dynamics Expert	2.0	$34,667
International Network Dispatch Expert	2.0	$34,667
International Tariff Design Expert	2.0	$34,667
International Loss Reduction Expert	1.0	$17,333
Total International Consultants	*7.0*	*$121,334*
National Consultants		
Director, Loss Reduction	40	20,000
Director, Load Shifting	40	20,000
Load Shifting Specialist	40	20,000
Load Shifting Engineer	40	20,000
Metering Specialist	40	20,000
Instrumentation Engineers	75	48,000
Network Analysts	76	37,500
Control Engineers	72	36,000
Operations Engineers	20	10,000
Plant Operators	76	37,500
Tariff Analysts	24	12,000
Administrative Staff	40.0	16,000
Total National Consultants (incl. Admin stafff)	*583.0*	*$297,000*
Grand Total Personnel	***590***	***418,334 (excl. travel)***

Travel Costs

UNDP will provide $36,733 worth of travel costs for international consultants and national project staff in support of activities for Component 1. This total is comprised of $28,733 in international consultant travel and $8,000 in local duty travel.

Training

UNDP will contribute $222,000 worth of in-service training on Component 1. See details in Annex 4.

Equipment

The following equipment will be paid for by UNDP funds for Component 1. See details in Annex 3.

Equipment Description	Total Cost
Local Transmission and Distribution Equipment	$63,123
Vehicle	$16,000
Internationally procured Equipment	$79,123
Total	$158,246

Other:

UN DESA Support Services Cost $19,507

3. UNDP/GEF Inputs (Components 2 and 3)

GEF will provide a total of $4,110,000 to this project. Of this amount $3,470,000 shall be used to help support and promote the energy service industry. Another $640,000 shall be use to provide funding for cogenerated power under this project.

GOE in cash contributions to this component include:

- GOE contribution of $356,000
- EEA contribution of $412,000 for national personnel
- OECP contribution of $114,000 for national personnel
- AEDC & EOS contribution of $7,000 for national personnel.

The above brings the total budget of these components 2 and 3 combined to $4,999,000.

Personnel

For National Consultants the Government of Egypt will assign or transfer to the project the staff listed below. Such staff will be suitably qualified and experienced. The GOE will be responsible for financing the payment of salaries (given in the table below in US dollars) and allowances commensurate with current policies and future policies which

may from time to time be decided by the GOE. For budget purposes, a flat total cost of US $ 500 has been used for all positions. In actuality, costs will vary across positions.

Position Title	Work Months	Total Salary Costs
International Consultants		
Project Document Preparation Consultants	2	$45,550
Equipment Standards Specialist	6.0	$104,000
Business/Technology Specialist	1.0	$17,333
Building Code Experts	12.5	$216,667
International Audit Specialist	2.0	$34,667
International ESCO Specialist	5.0	$115,556
International Regulatory Specialist	1.0	$17,333
International Energy Service Specialist	1.0	$17,333
International Finance Specialist	8.0	$184,889
International Legal Consultant	1.0	$23,111
International IRP Expert	9.0	$156,000
Subtotal International Consultants	*48.5*	*$932,439*
National Specialists (part time)		
Project Advisory Council	20.0	$59,250
Equipment Specialist	42.0	$63,000
Business Consultant	5.0	$7,500
Resource Economist	3.0	$3,000
Consumer Specialist	8.0	$8,000
Building Design Specialist	10.0	$15,000
Building Construction/Trades	3.0	$4,500
Building Code Work Group	45.0	$45,000
Audit Consultant/Trainer	28.0	$42,000
ESCO Consultant	18.0	$27,000
Finance Consultant	18.0	$27,000
Information/Media Consultant	9.5	$14,250
Cairo U: Cogeneration Systems Engineer	9.0	$13,500

SECTION E

Position Title	Work Months	Total Salary Costs
Cairo U: Agricultural Engineer	6.0	$9,000
Subtotal National specialists	*218.5*	*$ 329,000*
National Project Staff (full time)		
Project Technical Director	54.0	$162,000
Legal Analyst	24.0	$36,000
Administrative Staff	78	$31,200
Subtotal Project Staff	*156*	*$229,200*
National Consultants (part time staff)		
OECP Manager, Equipment	18	9,000
OECP Equipment Specialist	18	9,000
OECP Executive Assistant	20	10,000
OECP Energy Efficient Building Manager	18	9,000
OECP Engineers	46	23,000
EEA Economist	30	15,000
Seminar Coordination Specialist	30	15,000
Resource Planning Specialist	30	15,000
Director, Business and Finance	36	18,000
Director, Auditing and Tech Services	40	20,000
Director, Information and Promotion	40	20,000
EEA Staff Engineer	30	15,000
BRC Building Research Analysts	64	32,000
Information Specialists	96	48,000
Auditors	240	120,000
Tariff/Finance Analyst	24	12,000
Director, Small Power	40	20,000
Electrical Engineers	40	20,000
Instrumentation and Control Engineer	40	20,000
Mechanical Engineers	80	40,000
Finance Specialists	64	32,000

Position Title	Work Months	Total Salary Costs
Safety Engineer	30	
OECP Senior Project Manager	14	7,000
OECP Economist	2	1,000
OECP Education Specialist	14	7,000
EOS Engineers	12	6,000
AEDC Engineer	2	1,000
Testing and Certification Staff	12	6,000
Energy Conservation Studies Analyst	40	20,000
Energy Conservation Studies Engineers	60	30,000
Subtotal National Consultants	1,230	*$615,000*
Part Time Administrative Support		
PTD Assistant Liason to UN DESA	***42***	***29,400***
PTD Assistant Liason to Local Agencies	***42***	***29,400***
Part Time Administrative Support	***45***	***18,900***
Subtotal Administrative Support	***129***	***$77,700***
Grand Total Personnel (incl. personnel under OECP subcontract)	***1782***	***2,182,639***

Travel

UNDP/GEF will provide $349,855 worth of international travel, per diem, and local duty travel expenses for components 2 and 3. International consultant travel will be approximately $299,855, while local duty travel will make up the other $50,000.

Over and above the figure shown above, UNDP/GEF will provide $85,000 for travel to provide technical backstopping from UN DESA headquarters in New York.

Subcontracts

The following subcontracted components will be paid for by UNDP/GEF funds:

Item	Cost
OECP for Objectives 2 &3	$647,450
Buyer Market Assessment (see Output 2.7.2)	$25,000
Promotion Design (see Output 2.7.3)	$10,000

Video Preparation (see Output 3.2.2)	$10,000
Total	$692,450

Training and Visits

See details in Annex 4.

Item	Cost
In-Service Training	$33,000
Cogeneration Small Power Group Training	$69,000
Project Initiation & Steering Committee meetings	$24,500
Study Tours	$380,000
Total	$506,500

Equipment and Supplies

See details in Annex 3.

Item	Cost
National Procurement	
Computers/Printers	$52,000
Vehicles	$35,000
Photocopiers	$15,000
Photocopying/Distribution	$23,500
Auditing Equipment	$189,000
Audit Cost Sharing (Output 1.1)	$230,000
Guarantee Provision (Output 1.5)	$297,000
Cogeneration Equipment	$200,000
International Procurement	
Technical Documents	$7,045
Total	$1,048,545

Other

Item	Cost
Reporting Costs	$24,551
Operation and Maintenance	$3,200
Miscellaneous	$5,000
Sundry	$8,545

Tripartite Reviews	$20,000
UNDP/Cairo Support Cost	$135,197
UNDESA Support Service Cost	$159,614
Mid-Term Evaluation	$25,000
Total	$381,107

4. UNDP Country Programme Inputs

UNDP and other UN agencies are contributing to the proposed GEF project. UNDP shall also provide local support for the execution and monitoring of this program through its Cairo office. The UN authority DESA shall contribute to this project by serving as the responsible procurement agent for international procurement of consultants, study tours, and training.

UNDP has contributed US $ 800,00 to the project, and the local office in Cairo will play an important role in project management and implementation:

(a) being accountable to the main funding agency (GEF), UNDP/Cairo will work with the project steering committee to organize quarterly reviews and a mid-term review to insure that the project is being implemented in accordance with the policies of GEF and UNDP, and within the scope of the terms established in the project document.
(b) in consultation with MOEE and DESA, the UNDP will review the annual implementation work plan and approve the corresponding budget revision.
(c) UNDP will facilitate timely delivery of project inputs, including assistance in making logistic arrangements for visiting consultants and remitting payments to authorized staff.
(d) UNDP will provide assistance in custom clearance for imported equipment and remitting payment to local suppliers of equipment, if any.

5. Other Donor and Financial Institution Inputs

Two activities in the proposed GEF project will attempt to leverage the financial resources of donors, financial institutions, and other entities. The proposed GEF project will establish a partial guarantee facility to support the technical performance of energy service industry participants in loans made to partially privatized companies. This program will attempt to secure the participation of private commercial institutions and donor agencies in providing guarantees. By providing partial guarantees under a pilot program the proposed GEF project hopes to leverage $3 million of dollars in lending for energy efficiency investments by public and private banks in Egypt as well as from donor agencies. The success of this pilot program will encourage other lending institutions to extend even greater amounts of financing for energy efficiency investments in the future.

SECTION E

A second activity in this project will attempt to secure the participation of EEA and the EDCs to help provide lease financing for the purchase of energy efficient, compact fluorescent light bulbs.

Section F: RISKS

The proposed GEF project faces risks that are inevitable in any barrier removal project. The project only facilitates market actions and encourages greater energy efficiency. While the government can initiate the removal of some barriers, inevitably barrier removal projects depend largely upon the voluntary, or in some cases mandatory, actions of energy end users, government authorities and the energy services industry to take advantage of the removal of barriers and bring about a higher level of efficiency. However, as discussed below, in many cases the proposed program mitigates risks associated with voluntary actions by addressing simultaneously several key barriers to energy efficiency. The simultaneous removal of many barriers will reduce the likelihood that removal of one barrier will be ineffective due to the existence of other barriers.

Overall, Components 1-3

The program's success depends upon the successful coordination of activities from several institutions and firms. Both EEA and OECP have strong roles under this program. In several tasks, assistance is needed from international and domestic consultants. During the first year, activities under Component 2 of this program are designed to complement and work with USAID's ongoing ECEP program. In Objective 1 of Component 2, EEA will coordinate its efforts with those of Alexandria EDC and possibly other EDCs. Without sound logistical planning and coordination, the effectiveness of these diverse entities may be compromised. This program mitigates these logistical planning and coordination risks by incorporating the following:

- A full-time Project Technical Director (PTD) with authority to direct activities and to cancel or re-direct assignments where outputs are not being achieved.

- Detailed Terms of Reference (ToR) that stipulate requirements to hire highly qualified individuals.

- A High Level coordinating Committee and Project Advisory Council that can support the PTD by providing: (1) advice and guidance, (2) assistance in the re-direction of activities, and (3) support in soliciting assistance from other groups in Egypt.

Component 1

Reducing EEA's transmission line losses and improving the efficiency of EEA's generation through load management face technical risks. EEA's transmission line

losses of 7% are somewhat greater than average among electricity systems in the world. However, these losses are low in light of the long distances that power must travel between many of EEA's plants and electricity demand centers. Reducing transmission losses below their current levels will therefore be difficult. Likewise, improving the efficiency of EEA's power plants will be difficult given the fact that they already operate at about 38%, a level that is higher than that of the average efficiency level of plants in the U.S.
These risks associated with improving transmission line losses and improving power plant are mitigated by several factors:

- EEA's staff is strongly committed to reducing electricity line losses and improving power plant efficiency and believes that, with appropriate technical assistance, EEA can improve its efficiency in power plant generation and transmission.

- The assistance program outlined here includes nearly $400,000 for purchases of new, high efficiency equipment specifically designed to reduce transmission losses and improve power plant efficiency.

- Many efficiency improvements can be achieved by improving operating practices. The technical assistance provided in this program specifically addresses these practices.

Time of use tariffs will not by themselves shift electricity demand usage from peak to off-peak periods. Research in developed countries shows that, unless organized publicity campaigns clearly indicate to customers the rate consequences of peak versus off-peak energy use, customers will continue to make energy use decisions based on average electricity rates even where time-of-use tariffs are used. These risks will be mitigated by energy efficiency promotion activities under Component 2, which will provide energy customers clear information about time-of-use rates.

Component 2

Energy audits increase the likelihood that customers will undertake energy efficiency measures by increasing customers' awareness of potential energy efficiency savings. However, there is no guarantee that audits alone will lead to implementation of proposed energy efficiency measures. Customers may be more interested in other types of investment that increase production or enhance quality of life rather than saving energy. Poor availability of financing may limit energy end users' ability to afford the initial costs of energy efficiency. Energy audit recommendations may be convincing to technical staff but may not make a

sufficient impression upon decision makers to commit to energy efficiency measure implementation. This program attempts to mitigate these risks by:

- providing most audits to customers under a cost-sharing basis and thereby increasing the likelihood that those customers that elect to receive audits are committed to energy efficiency;

- initiating simultaneous activities to remove financing barriers that may inhibit some customers from making energy efficiency investments;

- emphasizing the need to provide audit reports and information that target decision makers with persuasive information on expected impacts of energy efficiency measures on firms' profits and/or product quality control;

The business advisory services, market information, and finance facilitation provided to the energy services industry and energy end-users will only be effective if:

- The services provided are properly focused and presented in a way that is meaningful to real world energy market participants. Overly academic reports and information will be ineffective.

- There is sufficient motivation on the part of consumers to demand energy efficiency services. While electricity rates and energy prices have increased, some subsidization continues, especially for high voltage industrial users and residential users at low usage levels (under 200 kWh per month). Low energy prices in the future will reduce market demand for energy services. Until adoption of equipment standards and building codes, there will be a suppressed demand for energy services.

To mitigate these risks, this program:

- provides specific funding to enlist the support and participation of private industries and consultants with a real world perspective
- includes active promotional and education activities to present a persuasive case for efficiency investments to energy users for whom there are clear economic benefits

The CFL leasing program depends upon a new leasing law (Financial Leasing Law 95) that just became law in 1995 and that has been untested for energy efficiency equipment. There is no certainty that the leasing law can be effectively used for the proposed residential CFL leasing program envisioned in Objective 1 of Component 2. Several factors mitigate these risks:

- The law contains provisions that technically allow energy efficient equipment to be leased and that grant lessors certain tax benefits (e.g., five years of tax exemption and the right to deduct equipment depreciation from taxes).

- Since passage of the law, 20 registered leasing companies have been established.

- Leasing has been used as a means for financing energy efficiency investments in developed countries and several developing countries such as India.

The partial loan guarantee program depends upon the cooperation from Egyptian public and private sector banks. In fact, a source of the program's strength is that it attempts to leverage support from such financing sources rather than providing direct financing. However, there are no guarantees that Egyptian banks will support this program. Several factors mitigate this risk.

- First, there are indications that banks such as Bank Misr will support this program. Bank Misr and Commercial International Bank are now providing medium- and long-term lending for investments other than energy efficiency. Bank Misr, is currently considering developing expertise in and commitment to energy efficiency finance. Other institutions will likely follow.

- There are many reasons why banks will want to participate in energy efficiency lending and loan guarantees. Loans made to reasonable credit risks that have partial guarantees from this program are likely to be profitable. Banks can improve their public image by providing financial support to energy efficiency loans that improve Egypt's environment and its economy.

There is no guarantee that efforts under the proposed GEF project to encourage certain policy reforms (e.g., reduction in custom duties, adoption of equipment standards and housing codes) will be successful. While EEA is well-placed to

help encourage these reforms, inevitably the decision to adopt these reforms rests with senior government officials in the Cabinet and Parliament. The proposed GEF project attempts to mitigate these risks by structuring any proposals as joint recommendations by a group of senior officials (e.g. Minister of Electricity and Energy, Minster of Industry, Minister of Housing, Chairman of OECP etc..) and by relying initially upon voluntary compliance with equipment standards and building codes (which will likely be more acceptable to government authorities), providing mechanisms to encourage such voluntary compliance, and introducing mandatory measures if and when voluntary action falls short of goals.

Component 3

The success of efforts under this program to encourage and support the interconnection and use of energy from small cogeneration power plants depends in part upon the success of Egypt's overall private power program. EEA has only recently begun initiating its private power program through a competitive solicitation for 300 MW of gas-fired power. Other countries such as India, Pakistan, and Indonesia have taken many years to develop private power programs. Delays in the development of rules and procedures for larger power projects could delay the interconnection of small cogeneration projects. Factors that mitigate these risks include:

- the strong economic attractiveness of cogeneration projects, especially those that use agricultural waste;

- support provided under this program that will help to continue fostering a strong commitment by EEA to private power;

- representation by OECP and EEAA on the High Level Coordinating that should help provide continued encouragement to EEA to continue making progress in obtaining power from private cogeneration.

Section G: PRIOR OBLIGATIONS AND PREREQUISITES

The prior obligations of the Government to the project are as follows:

Commitment of GOE cash funds;

Direct subcontract between EEA and OECP for management of Component 2 (Objectives 2 and 3);

Appointment of a qualified full-time Project Technical Director competitively ;

Agreement to locate the project office at a convenient location in central Cairo;

Agreement to provide all normal costs (base salary plus benefits and customary allowances) of GOE staff to be assigned to the project;

The project document will be signed by UNDP, and UNDP assistance to the project will be provided ,only if the prior obligations stipulated above have been met to UNDP's satisfaction.

Prerequisites of the project are listed as follows:

Arrangements for EDC involvement in the project, as relevant to Component 1 (load management), Component 2 (activities for Objectives 1 and 4), and Component 3 (cogeneration inter-connection and procedures)

Determination of which customers (EEA direct-served and/or large customers of EDCs) will be eligible to receive energy audits and other energy efficiency services

Resolution of what entities will provide the energy audits and technical services from the power sector to end users. This could be provided by one or more of the following: EEA, EDCs, OECP (for thermal uses), specialized institutes (such as TIMS), university centers (such as Cairo University's DRTPC), and private engineering and energy services companies

GOE policy commitment to implement the outcome of the objectives for eventual mandatory application of new building and equipment standards

GOE approval through the Central Agency for Organization and Administration of a small power group within EEA and the associated new positions

The project document will be signed by UNDP, and UNDP assistance to the project will be provided, subject to UNDP receiving satisfaction that the prerequisites listed above have been fulfilled or are likely to be fulfilled. When anticipated fulfillment of one or more prerequisites fails to materialize, UNDP may, at its discretion, either suspend or terminate its assistance.

Section H: PROJECT REVIEW, REPORTING, AND EVALUATION

Project Reviews, Reporting and Evaluation

1. (a) The project will be subject to tripartite review (joint review by representatives of the Government of Egypt, executing agency and UNDP) at least once every 12 months, the first such meeting to be held within the first 12 months of the start of full implementation. Although the project is nationally executed, the UN DESA will be invited as an observer to the tripartite review process. UN DESA will cover all expenses arising from its own participation in this event. The national Project Technical Director shall prepare and submit to each review meeting a Project Performance Evaluation Report (PPER). Additional PPERs may be requested, if necessary, during the project.

   (b) A project terminal report will be prepared for consideration at the terminal tripartite review meeting. It shall be prepared in draft sufficiently in advance to allow review by Government and UNDP at least four months prior to the terminal review.

2. Following the initial joint review, the project may also be subject to additional, interim reviews of specific components or component progress toward selected outputs at six month intervals, because of the innovative nature of the project and the creation of new organizations to carry out the component objectives. The need for such interim review, and its organization, terms of reference and precise timing, will be decided after consultation between the parties to the project document.

3. The project shall be subject to a mid-term evaluation approximately 24 months after the start of full implementation. The organization, terms of reference and exact timing of the evaluation will be decided after consultation between the parties to the project document, plus any associated UN agency. Funds have been included in the budget for an international consultant team to perform the mid-term evaluation. These funds and mission may not be reduced or eliminated except by the written agreement of all parties to the project document.

A time schedule of reviews, reports and the mid-term evaluation is attached as Annex 6.

Section J: BUDGET

The budgets showing the Government of Egypt in-kind contribution, UNDP co-financing inputs, UNDP/GEF inputs, and Government of Egypt cash contributions are shown on the following tables.

Government of Egypt
In-Kind Contributions
in Egyptian Pounds (LE)

Section J-1

BUDGET LINE	LINE DESCRIPTION	TOTAL BUDGETED COST, ALL YEARS			1998		1999		2000		2001		2002	
		Work Mos	LE/Month	LE Cost	W. Mos	Cost	W. Mos	Cost	W. Mos	Cost	W. Mos	Cost	W. Mos	Cost
51	Office Space			260,000		13,000		78,000		78,000		65,000		26,000
51.01	Utilities			100,000		5,000		30,000		30,000		25,000		10,000
53.01	Office Supplies			160,000		8,000		48,000		48,000		40,000		16,000
51.02	Telecommunications			80,000		4,000		24,000		24,000		20,000		8,000
	Totals	0	0	600,000	0	30,000	0	180,000	0	180,000	0	150,000	0	60,000

Section J-2

UNDP PROJECT BUDGET - COMPONENT 1

PROJECT NUMBER : EGY/97/003 budget revision B
PROJECT TITLE : EGYPT - ENERGY EFFICIENCY IMPROVEMENTS AND GREENHOUSE GAS REDUCTION
SOURCE OF FUNDS: UNDP
EXECUTING AGENT: GOVERNMENT OF EGYPT

BUDGET LINE	LINE DESCRIPTION	Total (1998-2002)		YEAR 1 1998		YEAR 2 1999		YEAR 3 2000		YEAR 4 2001		YEAR 5 2002	
		Wk Mos	$ COST	Wk Mos	$ COST	Wk Mos	$ COST	Wk Mos	$ COST	Wk Mos	$ COST	Wk Mos	$ COST
10	PROJECT PERSONNEL	W/M	$ COST										
11	International personnel												
11.51	Plant Dynamics Expert (DESA)	2.0	41,850	1.0	24,016	1.0	17,834						
11.52	Network Dispatch Expert (DESA)	2.0	41,850			2.0	41,850						
11.53	Tariff Design Expert (DESA)	2.0	41,850			2.0	41,850						
11.54	Loss Reduction Expert (DESA)	1.0	24,516	1.0	24,516								
11.99	*Subtotal*	*7*	*150,066*	*2.0*	*48,532*	*5.0*	*101,534*						
13	Administrative Support												
13.01	Full time Admin Support	24.0	9,600	12	4800	12	4800						
13.51	Part time Admin Support	16.0	6,400	4.0	1,600	4.0	1,600	4.0	1,600	4.0	1,600		
13.99	*Subtotal*	*40*	*16,000*	*16.0*	*6,400*	*16.0*	*6,400*	*4.0*	*1,600*	*4.0*	*1,600*		
15	Travel (local)												
15.99	*Subtotal*		*8,000*		*3,000*		*3,000*		*1,000*		*1,000*		
17	National Professional Staff												
	Part Time Consultant												
17.51	Director Loss Reduction	*40*	*20,000*	10	5000	10	5000	10	5000	10	5000		
17.52	Director Load Shifting	*40*	*20,000*	10	5000	10	5000	10	5000	10	5000		
17.53	Load Shifting Specialist	*40*	*20,000*	10	5000	10	5000	10	5000	10	5000		
17.54	Load Shifting Engineer	*40*	*20,000*	10	5000	10	5000	10	5000	10	5000		
17.55	Metering Specialist	*40*	*20,000*	10	5000	10	5000	10	5000	10	5000		
17.56	Instrumentation Engineers	*75*	*48,000*	24	12000	24	12000	15	12000	12	12000		
17.57	Tariff Analysts	*24*	*12,000*	8	4000	8	4000	8	4000				
17.58	Network Analysts	*76*	*37,500*	25	12500	25	12500	26	12500				
17.59	Control Engineers	*72*	*36,000*	24	12000	24	12000	24	12000				
17.60	Operations Engineers	*20*	*10,000*	8	4000	8	4000	4	2000				
17.61	Plant Operators	*76*	*37,500*	25	12500	25	12500	26	12500				
	subtotal part time consultants	*543*	*281,000*	*164*	*82000*	*164*	*82000*	*153*	*80000*	*62*	*37000*		
17.99	*Subtotal*	*543*	*281,000*	*164*	*82,000*	*164*	*82,000*	*153*	*80,000*	*62*	*37,000*	*0*	*0*
19	PROJECT PERSONNEL SUBTOTAL	**590**	**455,066**	**182**	**139,932**	**185**	**192,934**	**157**	**82,600**	**66**	**39,600**	**0**	**0**
30.00	TRAINING												

32	Study Tours												
32.01	Group Training Objective 4 (DESA)		45,000				45,000						
32.99	*Subtotal (DESA)*		*45,000*				45,000						
33	In-Service Training (Annex 4 for details)												
33.01	In-Service Training Objective 1		78,000		25,000		23,000		12,500		12,500		5,000
33.02	In-Service Training Objective 2		43,000		22,000		21,000						
33.03	In-Service Training Objective 3		38,000		10,000		28,000						
33.04	In-Service Training Objective 4		18,000				18,000						
33.99	*Subtotal*		*177.000*		*57,000*		*90,000*		*12,500*		*12,500*		*5,000*
39	**TRAINING SUBTOTAL**		***222,000***		**57,000**		**135,000**		**12,500**		**12,500**		**5,000**
40.00	**EQUIPMENT & SUPPLIES**												
45.01	Local Procurement		63,123		44,000		19,123						
45.02	Vehicle		16,000		16,000								
45.99	*Subtotal*		*79.123*		*60,000*		*19,123*						
46	International procurement		79,123		60,000		19,123						
46.99	*Subtotal*		*79,123*		*60,000*		*19,123*						
49	**EQUIPMENT & SUPPLIES SUBTOTAL**		**158,246**		**120,000**		**38,246**						
50.00	**MISCELLANEOUS**												
51.01	Miscellaneous		1,000		700		300						
51.02	Operation and Maint.		1,500				500		500		500		
51.99	*Subtotal*		*2,500*		*700*		*800*		*500*		*500*		
52.01	Reporting Costs		2,681				1,681		1,000				
52.99	*Subtotal*		*2.681*				*1,681*		*1,000*				
59	**MISCELLANEOUS SUBTOTAL**		**5,181**		**700**		**2,481**		**1,500**		**500**		
90.00	**PROJECT SUBTOTAL**		840.493										
93	UN DESA Support Service Cost		19,507		4,853		14,654						
99	**Grand Total**	**590**	**860,000**	**182**	**322,485**	**185**	**383,315**	**157**	**96,600**	**66**	**52,600**	**0**	**5,000**
102.00	**Cost Sharing EEA**		60,000										
999	**UNDP Input**		800,000										
	BALANCE REMAINING (DEFICIT)		0										

Section J-3

GEF PROJECT BUDGET

PROJECT NUMBER : EGY/97/G31/B/1G/99
PROJECT TITLE : EGYPT - ENERGY EFFICIENCY IMPROVEMENTS AND GREENHOUSE GAS REDUCTION
SOURCE OF FUNDS: GEF
EXECUTING AGENT: EEA

BUDGET LINE	LINE DESCRIPTION	Total 1998 - 2002		YEAR 1 1998		YEAR 2 1999		YEAR 3 2000		YEAR 4 2001		YEAR 5 2002	
		Wk Mos	$ COST	Wk Mos	$ COST	Wk Mos	$ COST	Wk Mos	$ COST	Wk Mos	$ COST	Wk Mos	$ COST
10	PROJECT PERSONNEL	W/M	$ COST										
11	International personnel												
11.51	Project Document Preparation Consultants	2	45,550	2	45,550	0	0	0	0	0	0	0	0
11.52	OECP Equipment Standards Specialist (DESA)	6.0	143,200	2.0	71,866	4.0	71,334	0.0	0	0.0	0	0.0	0
11.53	OECP Building Code Experts (DESA)	12.6	287,266	6.3	147,133	6.3	140,133	0.0	0	0.0	0	0.0	0
11.54	OECP Business/technology Expert (DESA)	1.0	26,000	1.0	26,000	0.0	0	0.0	0	0.0	0	0.0	0
11.55	ESCO Specialist (DESA)	5.0	148,556	2.0	56,555	2.0	56,555	1.0	35,446	0.0	0	0.0	0
11.56	Finance Specialist (DESA)	8.0	236,489	2.0	56,555	4.0	123,379	2.0	56,555	0.0	0	0.0	0
11.57	IRP Expert (DESA)	9.0	213,900	2.0	47,089	2.0	47,089	2.0	47,089	2.0	47,089	1.0	25,544
11.58	Energy Audit Specialist (DESA)	2.0	46,333	1.0	26,000	1.0	20,333	0.0	0	0.0	0	0.0	0
11.59	Regulatory Specialist (DESA)	1.0	26,000	0.0	0	1.0	26,000	0.0	0	0.0	0	0.0	0
11.60	Energy Service Specialist (DESA)	1.0	26,000	0.0	0	1.0	26,000	0.0	0	0.0	0	0.0	0
11.61	Legal Expert (DESA)	1.0	26,000	0	0	1.0	26,000	0.0	0	0.0	0	0.0	0
11.99	*Subtotal (Support cost to DESA)*	*48.6*	*1,225,294*	*18.3*	*476,748*	*22.3*	*536,823*	*5.0*	*139,090*	*2.0*	*47,089*	*1.0*	*25,544*
13	Administrative Support												
13.01	Full Time Adim. Assistants	78.0	42,000	17.0	9,000	17.0	9,000	17.0	9,000	17.0	9,000	10.0	6,000
13.02	PTD Assistant liason to UN DESA (DESA)	54.0	80,000	12.0	17,778	12.0	17,778	12.0	17,778	12.0	17,778	6.0	8,888
13.03	PTD Assistant liason to Local Agencies	54.0	80,000	12.0	17,778	12.0	17,778	12.0	17,778	12.0	17,778	6.0	8,888
13.51	Part Time Adim. Assistants	45.0	18,900	15.0	6,300	15.0	6,300	15.0	6,300				
13.99	*Subtotal*	*231.0*	*220,900*	*56*	*50,856*	*56*	*50,856*	*56*	*50,856*	*41*	*44,556*	*22*	*23,776*
15	Travel												
15.01	Local Duty Travel		40,000		10,000		10,000		10,000		10,000		
15.99	*Subtotal*		*40,000*		*10,000*		*10,000*		*10,000*		*10,000*		
16	Mission costs												
16.01	GEF/RBAS Tripartite Review Cost	1.0	20,000	0.25	5,000	0.25	5,000	0.25	5,000	0.25	5,000	0.0	
16.02	Mid-term Evaluation	1.0	30,000	0.0	0	0.0	0	1.0	30,000	0.0	0	0.0	0
16.03	Travel UN DESA		95,000		27,500		20,000		20,000		20,000		7,500
16.99	*Subtotal*	*2.0*	*145,000*	*0.3*	*32,500*	*0.3*	*25,000*	*1.3*	*55,000*	*0.3*	*25,000*	*0.0*	*7,500*
17	National Professional Staff												
17.01	Project Technical Director	54	138,000	12.0	30,000	12.0	30,000	12.0	30,000	12.0	30,000	6.0	18,000
17.02	Legal Analyst (start 1999 for 2 yrs)	24	36,000			12.0	18,000	12.0	18,000				
	Part Time Consultants												
17.51	Director Business and Finance	36	18,000	10	5000	8.0	4,000	8.0	4,000	8.0	4,000	2.0	1,000
17.52	Director Auditing and Technical Services	40	20,000	10	5000	10.0	5000	10.0	5000	8.0	4,000	2.0	1,000
17.53	Director Information and Promotion	40	20,000	10	5000	10.0	5000	10.0	5000	8.0	4,000	2.0	1,000
17.54	Resource Planning Specialist	30	15,000	6.0	3,000	6.0	3,000	6.0	3,000	6.0	3,000	6.0	3,000
17.55	Seminar Coordination specialist	30	15,000	6.0	3,000	6.0	3,000	6.0	3,000	6.0	3,000	6.0	3,000
17.56	EEA Economist	28	14,000	6.0	3,000	4.0	2,000	6.0	3,000	6.0	3,000	6.0	3,000

on J-3

GEF PROJECT BUDGET

PROJECT NUMBER : EGY/97/G31/B/1G/99
PROJECT TITLE : EGYPT - ENERGY EFFICIENCY IMPROVEMENTS AND GREENHOUSE GAS REDUCTION
SOURCE OF FUNDS: GEF
EXECUTING AGENT: EEA

BUDGET LINE	LINE DESCRIPTION	Total 19 8 - 2002 Wk Mos	Total 19 8 - 2002 $ COST	YEAR 1 1998 Wk Mos	YEAR 1 1998 $ COST	YEAR 2 1999 Wk Mos	YEAR 2 1999 $ COST	EAR 3 2000 Wk os	EAR 3 2000 $ COST	YEAR 4 2001 Wk Mos	YEAR 4 2001 $ COST	YEAR 5 2002 Wk Mos	YEAR 5 2002 $ COST
17.57	EEA Staff Engineer	30	15,000	6.0	3,000	6.0	3,000	6.0	3,000	6.0	3,000	6.0	3,000
17.58	Information Specialists	96	48,000	21	10500	21	10500	21	10500	21	10500	12	6000
17.59	Auditors	240	120,000	60.0	30000	60.0	30,000	60.0	30,000	60.0	30,000		
17.60	Tariff/Financial Analyst	24	12,000	6.0	3000	6.0	3000	6.0	3000	6.0	3000		
17.61	Director Small Power	40	20,000	10	5000	10.0	5000	10.0	5000	8.0	4,000	2.0	1,000
17.62	Electrical Engineer	40	20,000	10	5000	10.0	5000	10.0	5000	8.0	4,000	2.0	1,000
17.63	Instrumentation and Control E gineer	40	20,000	10	5000	10.0	5000	10.0	5000	8.0	4,000	2.0	1,000
17.64	Mechanical Engineers	80	40,000	20	10000	20.0	10000	20.0	10000	16.0	8,000	4.0	2,000
17.65	Finance Specialists	64	32,000	16	8000	16.0	8000	12.0	6000	12.0	6,000	8.0	4,000
17.66	Saftey Engineer	30	15,000	6.0	3,000	6.0	3,000	6.0	3,000	6.0	3,000	6.0	3,000
17.67	Alexandria Elec. Dist. Comp. Engineer	2	1,000	2	1000								
17.68	Energy Conservation Studies Analyst	40	20,000	10	5000	10.0	5000	10.0	5000	8.0	4,000	2.0	1,000
17.69	Energy Conservation Studies Engineers	60	30,000	15	7500	15.0	7500	15.0	7500	15.0	7500		
17.70	Other part time specialists (see section E)	106	186,000	25.0	44,000	25.0	44,000	25.0	44,000	25.0	44,000	5.5	10,000
17.99	*Subtotal*	*1,173.5*	855,000	*277.0*	*194,000*	*2 0*	*209,000*	*281.0*	*208,000*	*253.0*	*182,000*	*79.5*	*62,000*
19	Component T tal	1,455.1	2,486,194	352	764,104	362	831,679	343	462,946	296	308,645	103	118,820
20.00	SUBCONTRACTS												
21.01	Buyer Market Assesment (See Section E.)		25,000		25,000								
21.02	Promotion Design (See Section E.)		10,000				10,000						
21.03	Video Preparation (See Section E.)		10,000						10,000				
21.04	OECP Subcontract (see sub-budget attached)	395	647,450	169	313,700	163	219,700	25	43,950	23	47,950	16	22,150
21.99	*Subtotal*	395	692,450	169	*338,700*	*163*	*229,700*	*25*	*53,950*	*23*	*47,950*	*16*	*22,150*
29	Component total	395	692,450	169	338,700	163	229,700	25	53,950	23	47,950	16	22,150
30.00	TRAINING (See Annex 4 for details)												
32.01	Group Training - Comp 2/obj. 1 (DESA)		50,000				50,000						
32.02	Group Training - Comp 2/obj. 4 (DESA)		50,000				50,000						
32.03	OECP Group Training - Comp 2/obj. 2 (DESA)		110,000		80,000		30,000						
32.04	OECP Group Training - Comp.2/object.3 (DESA)		100,000				100,000						
32.05	Group Training - Comp.3/object 1 (DESA)		50,000				50,000						
32.99	*Subtotal (DESA)*		*360,000*		*80,000*		*280,000*						
33.01	In-Service Training - Comp.2/object 1		23,000		23,000								
33.02	Cogeneration Training for Small Power Group		69,000		43,000		18,000		8,000				

Section J-3

GEF PROJECT BUDGET

PROJECT NUMBER : EGY/97/G31/B/1G/99
PROJECT TITLE : EGYPT - ENERGY EFFICIENCY IMPROVEMENTS AND GREENHOUSE GAS REDUCTION
SOURCE OF FUNDS: GEF
EXECUTING AGENT: EEA

BUDGET LINE	LINE DESCRIPTION	Total 1998 - 2002 Wk Mos	Total 1998 - 2002 $ COST	YEAR 1 1998 Wk Mos	YEAR 1 1998 $ COST	YEAR 2 1999 Wk Mos	YEAR 2 1999 $ COST	YEAR 3 2000 Wk Mos	YEAR 3 2000 $ COST	YEAR 4 2001 Wk Mos	YEAR 4 2001 $ COST	YEAR 5 2002 Wk Mos	YEAR 5 2002 $ COST
33.03	In-Service Training - Comp.3/object 4		10,000						10,000				
33.10	Project Initiation		15,000		15,000								
33.11	Steering Committee Meetings		4,500		1,000		1,000		1,000		1,000		500
33.99	*Subtotal*		121,500		*82,000*		*19,000*		*19,000*		*1,000*		*500*
39	**TRAINING SUBTOTAL**		**481,500**		**162,000**		**299,000**		**19,000**		**1,000**		**500**
40.00	**EQUIPMENT & SUPPLIES (See Sect. E for details)**												
45	National Procurement												
45.01	Computers/Printers		52,000		17,000		17,000		13,000		5,000		
45.02	Vehicles		35,000		35,000								
45.03	Photocopiers		15,000		5,000		5,000		5,000				
45.04	Photocopying/Distribution		23,500		8,500		8,000		5,000		2,000		
45.05	Auditing Equipment		189,000		54,000		54,000		54,000		27,000		
45.06	Audit Cost Sharing		230,000		65,000		65,000		65,000		35,000		
45.07	Guarantee Provision		297,000		85,000		85,000		85000		42000		
45.08	Cogen Equipment		200,000		70,000		70,000		46,000		14,000		
45.99	*Subtotal*		*1,041,500*		*339,500*		*304,000*		*273,000*		*125,000*		*0*
46	International procurement												
46.01	Technical documents		7,045		6,645		400						
46.99	*Subtotal*		7,045		*6,645*		*400*						
49	**EQUIPMENT & SUPPLIES SUBTOTAL**		**1,048,545**		**346,145**		**304,400**		**273,000**		**125,000**		**0**
50.00	**MISCELLANEOUS**												
51.01	Operation and Maint.		3,200		500		1,000		1,000		500		200
51.02	Other		5,000		1,000		1,000		1,000		1,000		1000
51.99	*Subtotal*		*8,200*		*1,500*		*2,000*		*2,000*		*1,500*		*1,200*
52.00	Reporting Costs												
52.01	Reporting and Promotion		14,000		3,000		3,000		2,000		2,000		4,000
52.99	*Subtotal*		*14,000*		*3,000*		*3,000*		*2,000*		*2,000*		*4,000*
53	Sundry												
53.99	*Subtotal*		*7,151*		*1,151*		*2,000*		*2,000*		*2,000*		
54.01	UNDP/Cairo - Project Support Services		134,985		46,294		47,170		23,496		13,968		4,057
59	**MISCELLANEOUS SUBTOTAL**		**164,336**		**51,945**		**54,170**		**29,496**		**19,468**		**9,257**

Section J-3

GEF PROJECT BUDGET

PROJECT NUMBER : EGY/97/G31/B/1G/99
PROJECT TITLE : EGYPT - ENERGY EFFICIENCY IMPROVEMENTS AND GREENHOUSE GAS REDUCTION
SOURCE OF FUNDS: GEF
EXECUTING AGENT: EEA

BUDGET LINE	LINE DESCRIPTION	Total 1998 - 2002 Wk Mos	Total 1998 - 2002 $ COST	YEAR 1 1998 Wk Mos	YEAR 1 1998 $ COST	YEAR 2 1999 Wk Mos	YEAR 2 1999 $ COST	YEAR 3 2000 Wk Mos	YEAR 3 2000 $ COST	YEAR 4 2001 Wk Mos	YEAR 4 2001 $ COST	YEAR 5 2002 Wk Mos	YEAR 5 2002 $ COST
90.00	**PROJECT SUBTOTAL**	**1,850**	**4,873,025**	**520**	**1,662,894**	**524**	**1,718,949**	**368**	**838,392**	**319**	**502,063**	**119**	**150,727**
93.01	UN DESA : Project Support Services		161,974		52,898		83,460		15,687		6,487		3,443
99	**Grand Total**		**5,035,000**		**1,715,792**		**1,802,409**		**854,079**		**508,550**		**154,170**
100	**COST SHARING**												
101.00	**Cost Sharing Government of Egypt**		356,000										
102.00	**Cost Sharing EEA**		412,000										
102.00	**Cost Sharing OECP**		150,000										
103.00	**Cost Sharing AEDC**		1,000										
104.00	**Cost Sharing EOS**		6,000										
109	**Cost Sharing Component Total**		925,000										
999	**GEF Input**		**4,110,000**		1,400,577		1,471,281		697,172		415,122		125,848
	BALANCE REMAINING (Deficit)		0										

Section J-3

GEF PROJECT SUB-BUDGET FOR OECP

PROJECT NUMBER : EGY/97/G31/B/1G/99
PROJECT TITLE : EGYPT - ENERGY EFFICIENCY IMPROVEMENTS AND GREENHOUSE GAS REDUCTION
SOURCE OF FUNDS: GEF
EXECUTING AGENT: EEA - Subcontract to OECP

BUDGET LINE	LINE DESCRIPTION	Total 1998 - 2002 Wk Mos	Total 1998 - 2002 $ COST	YEAR 1 Wk Mos	YEAR 1 $ COST	YEAR 2 1999 Wk Mos	YEAR 2 1999 $ COST	YEAR 3 2000 Wk Mos	YEAR 3 2000 $ COST	YEAR 4 2001 Wk Mos	YEAR 4 2001 $ COST	YEAR 5 2002 Wk Mos	YEAR 5 2002 $ COST
		W/M	$ COST										
15	Travel												
15.01	Local Duty Travel		*16,500*		3,500		3,500		3,500		3,500		2,500
15.99	*Subtotal*		*16,500*		*3,500*		*3,500*		*3,500*		*3,500*		*2,500*
17	National Professional Staff												
17.51	14 Equipment Consultants at 3 months each.	42	63,000	20.0	30,000	20.0	30,000	2.0	3,000				
	Part Time Consultants												
17.51	OECP Senior Project Manager	14	7,000	7.0	3,500	7.0	3,500						
17.52	OECP Executive Assitant	20	10,000	4.0	2,000	4.0	2,000	4.0	2,000	4.0	2,000	4.0	2,000
17.53	OECP Engineers	46	23,000	10.0	5,000	10.0	5,000	10.0	5,000	10.0	5,000	6.0	3,000
17.54	Education Specialist	14	7,000	7.0	3,500	7.0	3,500						
17.55	EEA Economist	2	1,000	2.0	1,000								
17.56	OECP Economist	2	1,000	2.0	1,000								
17.57	OECP Equipment Manager	18	9,000	9.0	4,500	9.0	4,500						
17 58	OECP Equipment Specialist	18	9,000	9.0	4,500	9.0	4,500						
17.59	Energy Efficient Building Manager	18	9,000	9.0	4,500	9.0	4,500						
17 60	Energy Efficient Building Research Analysts	64	32,000	32.0	16,000	32.0	16,000						
17.62	Egypt. Org. For Standards Engineers	12	6,000	6.0	3,000	6.0	3,000						
17.63	Testing And Certification Staff	12	6,000	6.0	3,000	6.0	3,000						
			120,000										
	Part Time Specialists												
17.64	Equipment Specialists	42	63,000	9.0	13,500	9.0	13,500	9.0	13,500	9.0	13,500	6.0	9,000
17.65	Manufacturing Business Expert	5	7,500	2.5	3,750	2.5	3,750						
17.66	Consumer Consultant	8	8,000	4.0	4,000	4.0	4,000						
17.67	Building Design Consultant	10	15,000	5.0	7,500	5.0	7,500						
17.68	Building Consutruction and Trades Consult.	3	4,500	3.0	4,500								
17.69	Building Code Work Group Consults.	45	45,000	22.0	22,000	23.0	23,000						
		113	**143,000**										
17.99	*Subtotal*	*395.0*	*326,000*	*169*	*136,750*	*163*	*131,250*	*25.0*	*23,500*	*23.0*	*20,500*	*16.0*	*14,000*
19	**Component Total**	**395.0**	**342,500**	169	**140,250**	163	**134,750**	25	**27,000**	**23**	**24,000**	**16**	**16,500**
30.00	**TRAINING (See Annex 4 for details)**												
33.01	In-Service Training - Comp.2/object 2		60,000		20,000		40,000						
33.02	In-Service Training - Comp.2/object 3		135,000		105,000		30,000						
33.99	*Subtotal*		*195,000*		*125,000*		*70,000*		*0*		*0*		*0*

39	TRAINING SUBTOTAL		195,000		125,000		70,000		0	0	0
40.00	EQUIPMENT & SUPPLIES (See Sect. E for details)										
45	National Procurement										
45.01	Computers/Printers		15,000		15,000						
45.02	Vehicles		20,000		20,000						
45.03	Photocopying/Distribution		2,250		450		450		450	450	450
45.04	Promotional expenses		40,000		1,000		9,000		11,000	18,000	1,000
45.99	*Subtotal*		*77,250*		*36,450*		*9,450*		*11,450*	*18,450*	*1,450*
46	International procurement										
46.01	Software		7,500		7,500						
46.99	*Subtotal*		*7,500*		*7,500*		*0*				
49	EQUIPMENT & SUPPLIES SUBTOTAL		84,750		43,950		9,450		11,450	18,450	1,450
50.00	MISCELLANEOUS										
51.01	Operation and Maint		2,200		500		500		500	500	200
51.02	Other		8,000		1,000		2,000		2,000	2,000	1000
51.99	*Subtotal*		*10,200*		*1,500*		*2,500*		*2,500*	*2,500*	*1,200*
52.01	Reporting Costs		10,000		2,000		2,000		2,000	2,000	2,000
52.99	*Subtotal*		*10,000*		*2,000*		*2,000*		*2,000*	*2,000*	*2,000*
53	Sundry										
53.99	*Subtotal*		*5,000*		*1,000*		*1,000*		*1,000*	*1,000*	*1,000*
59	MISCELLANEOUS SUBTOTAL		25,200		4,500		5,500		5,500	5,500	4,200
90.00	PROJECT SUBTOTAL	395	647,450	169	313,700	163	219,700	25	43,950	23 47,950	16 22,150
99	Grand Total	395	647,450	169	313,700	163	219,700	25	43,950	23 47,950	16 22,150
100	COST SHARING										
101.00	Cost Sharing -Govt.		150,000								
109	Cost Sharing Component Total (OECP)		150,000								
999	GEF Input (less GEF input for international personnel and Study tours)		497,450								

EGYPT - ENERGY EFFICIENCY IMPROVEMENTS AND GREENHOUSE GAS REDUCTION

TABLE OF CONTENTS

ANNEX 1 - COMPONENT 1

EGY/97/G31/A/1G/99 - Energy Efficiency Improvements and Greenhouse Gas Reduction in Egypt
Component 1: End of Project Estimate

Calculation based on fuel consumption and thermal generation in 1995/96 Annual Report of MOEE/EEA. Calculation does not account for additional fuel consumption as demand grows, or possible changes in relative amounts of mazout and natural gas.

2% reduction in transmission system loss at end of project

91% of generated thermal load is transmitted through network; the remainder is taken as station load

Consumption of mazout for power generation: 2.59 MT, 90% carbon

Consumption of natural gas for power generation: 6.99 MTOE, 70% carbon based on volumetric analysis of gas composition

Potential reduction of GHG (CO_2): 0.48 MT/year

[MT = million metric tons]

Exhibit 1: Summary of Energy Efficiency

Objective	utput <1	Description	MTOES	Tons CO2
1	1	Audit Program	0.12	0.33
	2	Business Advisory Services	0.10	0.28
	3	Custom Duty Reductions	0.09	0.25
	4	Residential CFL Leasing Program	0.50	1.38
	5	Loan Guarantee Program	0.56	1.55
	Total Objective 1		1.37	3.77
2		Equipment Standards	1.24	3.40
3		Building Codes	0.39	1.08
4		Energy Efficiency Center <2>	0	0.00
	Total Component 2		3.00	8.25

<1> See Exhibits 2-6 for savings assumptions for Objective 1. See Exhibits 7-8 for savings assumptions for Objectives 2 and 3.

<2> No direct energy efficiency benefits assumed from Objective 4. The activities in this objective facilitate savings from other objectives.

Exhibit 2
Energy Savings from Component 2, Objective 1, Output 1: Audits

	Customer Type	EEA Direct Served	EDC Customer	Total/ Average
Audit Recipient Informati	Service Provided	Direct Audits	Audit Incentives	
	Number of Facilities	20	200	220
	Average Electricity Use/Facility (GWH)	75	10	16
	Total Electricity Use (GWH)	1,500	2,000	3,500
	Thermal Equivalent (Trill. Btu)	13.500	18.000	31.500
	MM Tons Oil Equivalent (MTOE)	**0.375**	**0.500**	**0.875**
Energy Savings	Customer Probability of Adopting Recommended Measures (%)	50%	50%	50%
	% Savings of Measures Recommended	30%	25%	27%
	Probability Wghtd Savings (MTOE)	**0.06**	**0.06**	**0.12**

Exhibit 3
Energy Savings from Component 2, Objective 1, Output 2: Business Advisory Services

Number of ESCOs Created with Assistance of Seminars	3
Annual Business Volume per ESCO as of 2010 ($000)	5,000
Total Annual ESCO Business Volume Generated Through Training ($000)	15,000
Average Payback Period per Unit of Business Volume	3
Average Annual Savings ($000)	5,000
Average Price per Ton of Oil ($/Ton)	50.00
Total Annual Energy Savings (MTOE)	0.10

Exhibit 4
Energy Savings from Component 2, Objective 1, Output 3: Custom Duty Reductions

Total Egypt Energy Use (MTOE)	36
Average % Savings from Equipment	30%
% Equipment Targeted	33%
% Contribution <1>	50%
% of Targeted Equipment Likely to Chan	5%
Net Effect of Output 3	**0.09**

<1> Assumes that other parties will contribute to program success. Only 50% of credit therefore assumed attributable to Output 3

Exhibit 5
Energy Savings from Component 2, Objective 1, Output 4: Residential CFL Leasing Program

Number of Customers Participating (000	2,000
Number of CFLs/Customer	5
Total Number of CFLs (000)	10,000
Electricity Savings per CFL (KWH)	200
Total Annual Electricity Savings (GWH)	2,000
Energy Equivalent (MTOE)	**0.5**

Exhibit 6
Energy Savings from Component 2, Objective 1, Output 5: Loan Guarantee Program

Number of Guarantees	3
Replication Factor	10
Total Number of Performance Contract Loans Facilitated	30
Energy Use per Facility (MTOE)	0.02
Total	0.56

Exhibit 7
Energy Savings from Component 2, Objective 3: Building Codes

	Total	Commercial <2>
Projected Energy Use, FT 1996/1997 to FY 2009/2010 (GWH) <1>		
1996/1997	48,346	4,835
2001/2002	67,192	6,719
2009/2010	107,376	10,738
Total Change in Sales, FY 1996/1997 to FY 2009/2010 (GWH)	59,030	5,903
Estimated Energy Use Increase Due to New Commercial Buildings (GWH) <3>	NA	3,935
Potential Energy Savings in New Buildings (GWH) <4>		1,574
Thermal Equivalent (MTOE)	NA	0.39

<1> Source: EEA Electricity Sales Forecast
<2> Estimated to be 10% of total electricity demand
<3> Assumed to be 2/3 of total increase in commercial electricity demand betwe FY 96/97 and FY 09/10.
<4> Estimated to be 40% of commercial electricity demand increase attributable new buildings

Exhibit 8
Energy Savings from Component 2, Objective 2: Equipment Standards

	Industrial Lighting	Combustion Control	Total
Total Estimated Savings Potential (MTOE) <1>	0.930	1.170	2.100
Percent of Total Savings Potential Attributable to Equipment Standards	%	50%	59%
Estimated Energy Savings Resulting	0.651	0.585	1.236

<1> Source: USAID/ECEP, Assessment of Demand Side Management Potential in

ANNEX 1 - COMPONENT 3

EGY/97/G31/A/1G/99 - Energy Efficiency Improvements and Greenhouse Gas Reduction in Egypt

Component 3: Contribution from Cogeneration

The design of a cogeneration system depends on individual process requirements for heat and electric power, and the type of fuel that is available at the site. Equipment options for typical systems in the size range of 1 to 10 MW include several types of engines, furnaces and boilers, steam turbines, heat exchangers and waste heat recovery units. Practical fuel options include heavy fuel oil (mazout), natural gas, and agricultural biomass.

Medium-speed diesel engines are capable of operation on heavy fuel oil. Spark-ignited engines and gas turbines may be fueled with natural gas or low heating value gas. The engines provide shaft power for generation of electricity. Furnaces can be fueled with heavy oil, gas, or biomass, to produce process heat or to raise steam. Steam turbines can operate at high back pressure when the exhaust steam is required for other industrial purposes, or into a condenser.

Design of a cogeneration system is an optimization process among the options to combine use of heat and power in a practical way to provide high efficiency at the lowest cost of operation.

The following example is based on a typical industrial facility (such as a paper mill, textile plant, ceramics factory, etc.) that requires electricity purchased from EEA to run machinery and fuel to provide process heat. The connected load is 5 MW, and monthly power consumption corresponds to an average load of 2.5 MW.

In Case 1, heavy oil is burned in a boiler to raise steam and provide heat for a drying process. The monthly fuel requirement is 1000T (mazout).

In Case 2, natural gas is burned in a boiler to raise steam and provide heat for a drying process. The monthly fuel requirement is 1,070,000 standard cubic meters of Egyptian natural gas.

Nominal Performance: Energy Requirements

Typical EEA thermal power plant generation efficiency = 34%
Assumed UPS transmission losses = 5%
Efficiency of delivered power = 0.95 x 0.34 = 32%

Yearly power consumption = 2.5 MW x 8760 hours = 21,900,000 kWh

Conversion to TOE/year burned in EEA power plant:

$$\frac{21{,}900{,}000 \text{ kWh} \times 3413 \text{ BTU/kWh}}{0.32 \times 18000 \text{ BTU/LB} \times 2205 \text{ LB/T}} = 5{,}885 \text{ TOE/year}$$

Yearly consumption of fuel for process heat = 12,000 TOE/year
Same equivalent tonnes of oil for Case 1 (mazout) and Case 2 (NG).

Efficiency of process heat recovery from fuel combustion = 80%

Useful process heat required =

$$= 12000 \text{ T/yr.} \times 2205 \text{ LB/T} \times 18000 \text{ BTU/LB} \times 0.80 = 3.810 \times 10^{11} \text{ BTU/year}$$

Total fuel consumption in power plant and factory = 5885 + 12000 = 17,885 TOE/year

Case 1:

The industrial facility installs a new cogeneration system based on medium-speed diesel-engine-generator sets with 5 MW generating capacity. The system operates steadily at 5 MW output. The fuel is mazout. The industrial facility takes the power that it requires, which averages to 2.5 MW as above, and delivers remaining surplus power to the UPS grid, which averages to an additional 2.5 MW. Waste heat is recovered from diesel engine exhaust and from the cooling jacket which reduces the amount of fuel required for process heat.

Diesel genset efficiency = 30%

Waste heat recovery = 35%; cogeneration efficiency = 65%

Engine fuel requirement to produce 5 MW:

$$\frac{5000 \text{ kW} \times 8760 \text{ hour/year} \times 3413 \text{ BTU/kWh}}{0.30 \times 18000 \text{ BTU/LB} \times 2205 \text{ LB/T}} = 12{,}555 \text{ TOE/year}$$

Fuel Energy Recovered from Waste Heat:

$$12555 \text{ T/yr.} \times 2205 \text{ LB/T} \times 18000 \text{ BTU/LB} \times 0.35 = 1.744 \times 10^{11} \text{ BTU/year}$$

$$\text{Makeup fuel needed} = \frac{(3.810 - 1.744) \times 10^{11} \text{ BTU/yr.}}{18000 \text{ BTU/LB} \times 2205 \text{ LB/T} \times 0.80} = 6{,}507 \text{ TOE/year}$$

Total factory fuel consumption for Case 1 cogeneration system producing 5 MW with heat recovery, and for production of remaining heat not provided by cogeneration =

$$= 12555 + 6507 = 19062 \text{ TOE/year}$$

Case 2:

The industrial facility installs a new cogeneration system based on an aeroderivative gas turbine engine-generator set with 5 MW capacity. It operates steadily at 5 MW output. The fuel is Egyptian natural gas. The industrial facility takes the power that it requires, which averages to 2.5 MW as above, and delivers remaining surplus power to the UPS grid, which averages to an additional 2.5 MW. Waste heat is recovered from gas turbine engine exhaust which reduces the amount of fuel required for process heat.

Gas turbine genset efficiency = 25%

Waste heat recovery = 50%; cogeneration efficiency = 75%

Engine fuel requirement to produce 5 MW:

$$\frac{5000 \text{ kW} \times 8760 \text{ hour/year} \times 3413 \text{ BTU/kWh}}{0.25 \times 18000 \text{ BTU/LB} \times 2205 \text{ LB/T}} = 15{,}066 \text{ TOE/year}$$

Fuel energy recovered from waste heat:

$$15066 \text{ T/yr.} \times 2205 \text{ LB/T} \times 18000 \text{ BTU/LB} \times 0.50 = 2.990 \times 10^{11} \text{ BTU/year}$$

$$(3.810 - 2.990) \times 10^{11} \text{ BTU/yr.}$$

$$\text{Makeup fuel needed} = \frac{}{18000 \text{ BTU/LB} \times 2205 \text{ LB/T} \times 0.80} = 2{,}582 \text{ TOE/year}$$

Total factory fuel consumption for Case 2 cogeneration system
and for production of remaining heat = 15066 + 2582 = 17648 TOE/year

There is a reduction in overall fuel consumption, as follows:

Power plant fuel requirement to produce 5 MW:

$$\frac{5000 \text{ kW} \times 8760 \text{ hour/year} \times 3413 \text{ BTU/KWH}}{0.32 \times 18000 \text{ BTU/LB} \times 2205 \text{ LB/T}} = 11{,}770 \text{ TOE/year}$$

Factory consumption of fuel for process heat = 12,000 TOE/year

Total fuel consumption before cogeneration: = 23,770 TOE/year

	Case 1	Case 2
Total fuel consumption with cogeneration	19,062 TOE/year	17,648 TOE/year
Reduction in fuel consumption	4,708 TOE/year	6,122 TOE/year

When extrapolated to a total cogeneration contribution of 1000 MW, the fuel reduction based on the above example of a 5 MW cogeneration system (assuming the average of the two cases, or a savings of 5,415 TOE/year) is 1.08 MTOE/year.

With EEA's current mix of mazout (27%) and natural gas (73%) for thermal power generation, the corresponding reduction in CO2 emissions are 0.96 MT/year associated with mazout (90% carbon) and 2.02 MT/year associated with natural gas (70% carbon based on volumetric analysis of gas composition).

Potential reduction of GHG (CO2): 3.0 MT/year

[MT = million metric tons]

ANNEX 2 - INCREMENTAL COST ANALYSIS

EGY/97/G31/A/1G/99-Energy Efficiency Improvements and Greenhouse Gas Reductions

Broad Development Goals

1. With a growing economy, Egypt's demand for electricity has increased rapidly in recent years, and is likely to continue increasing for the foreseeable future. Not surprisingly, its developmental goal is to meet the ever-increasing demand for electricity by increasing its supplies. Increasing the efficiency of transmission and consumption will also have the effect of reducing the need for supply-side enhancements. However, to date, many of the actions which can be taken to improve the situation have not been undertaken due of the existence of a number of barriers of a technological, human-resource, or legal nature.

Global Environmental Objective:

2. The global environmental objective being pursued through this project is the reduction of GHG emissions through increased efficiency in electricity transmission and utilization and the expanded use of cogeneration to supply power to the national electricity grid. As such, this project has been designed to correspond to GEF Climate Change Programme 5: Removing Barriers to Energy Efficiency and Energy Conservation. As described in the Project Document, the different components of the project will all focus on removing different barriers to the achievement of greater energy efficiency (electricity and fuel) and the increased supply of power through cogeneration.

BASELINE

3. Under the baseline, Egypt's energy consumption per unit of GNP would remain roughly double that of comparable economies in the region. As part of the economic reform program upon which Egypt embarked in 1990, a plan to achieve a weighted average tariff of 100% of the LRMC by 1996 was implemented through a gradual annual price increase. The energy pricing reform initiated in 1990 also aimed to achieve fuel pricing that is equivalent to 100% of the import parity prices. Through these gradual increases, pricing equivalent slightly higher than 100% of the LRMC was achieved by the outcome of 1996 (based on EEA calculations). Thus, many of the financial incentives for energy conservation will be put in place with this shift in policy. However, experience has shown that this is a necessary, but insufficient condition needed to achieve energy efficiency improvements of the type discussed in this proposal.

4. For the transmission and distribution sector in Egypt, this project is critical for the continued acceptable operation of the system. Without intervention from the side of this project, it is likely that no action will be taken to sustain or improve the transmission system in Egypt. At best, the present rate of transmission losses (7%) would remain

unchanged. More likely, however, would be the increase in the rate of losses if no action is taken to sustain and improve on the achievements made in this sector in Egypt. Moreover, if the concept of load management and load shifting is not introduced and widely practiced in Egypt, magnitudes of daily peak points could increase resulting in the need for further capacity expansion and also thereby increasing the peak-to-minimum load swing.

5. This project is also vital to energy conservation in Egypt. Without intervention in this field, there will be a continued increase in the already high energy consumption per unit of GNP in Egypt. Egypt is recommitting itself to energy pricing reform and will thereby create the financial incentives that are necessary, but alone not sufficient, for the wide application of energy conservation practices. The Government of Egypt is providing US $ 784,000 (in cash) as a baseline contribution to activities in this field to be undertaken through Component 2 of the current project.

6. At last, since an essential and adequate framework for cogeneration does not exist in Egypt at this moment and since such a framework is not likely to be introduced without a catalytic push from the outside due to the transaction barriers mentioned in the brief, opportunities for cogeneration will not be utilized in the foreseeable future. Potential reductions in CO2 emissions from the increased energy recovery from production of power, the sale of excess power to the grid, and the deferral of capacity expansion will therefore never be realized. The Government of Egypt is providing US $ 141,000 (in cash) as a baseline contribution to activities in this field to be undertake as part of Component 3 of this project.

GEF Alternative:

7. As described in the Project Document, the different components of the project will all focus on removing different barriers to the achievement of greater electrical energy efficiency and increased supply of power through cogeneration. More specifically however, and as can be seen in the Project Document, Component 1 (Loss reduction, and load management in the Unified Power System) will concentrate on providing technical assistance and training to improve the efficiency of electrical transmission. After the completion of this task, EEA should have a feasible programme of profitable investments in for example reactive power to increase the efficiency of energy transmission. Moreover, the component will also provide technical assistance and training to assist EEA to institute better cooperation between energy suppliers and consumers with the goal of instituting a time-of-day peak pricing scheme. If, based upon the evaluation of the options developed as part of this component, the policy decision is taken to proceed with time-of-day pricing, all information, personnel and institutional barriers should be overcome to enable EEA to implement this practice. This component is being co-financed by the UNDP and there is therefore no GEF financing requested for this component.

8. Component 2 of the project (Energy Conservation and Engineering Services and Support) will in turn focus upon creating a national institution which will play the important role of focusing on energy efficiency. At present, no energy efficiency standards exist, and Component 2 will result in their formulation as well as establishing a training facility and

raising public awareness to energy efficiency opportunities linked to this and other ongoing projects. With a high-level national institution focusing on energy efficiency, many of the public information, training, and regulatory obstacles to improved energy efficiency will be met. Furthermore, this component will seek to address the shortage of skilled personnel and private-sector entities dealing with investments in energy efficiency. It will establish an infromation center which will serve as an incubator for energy service companies (ESCOs). With this national center established, Egypt's private sector will be in a better position to establish ESCOs taking advantage of the many profitable energy efficiency investments which exist.

9. At last, Component 3 (Cogenerated Power) is intended to address the legal obstacles to the purchasing of surplus cogenerated power by the EEA. At present, there is no framework for agreements allowing EEA to purchase power. With the technical assistance provided as part of this component, this obstacle shall be removed, paving the way for the purchase of power from the numerous cogenerators found across Egypt. As the detailed calculations in Annex 7 demonstrate, there are significant global benefits to be achieved for cogeneration

DOMESTIC AND GLOBAL BENEFITS

10. The project could potentially achieve reductions in GHG emissions (CO2) of 11.73 million tons by the year 2010. However, it is important to emphasize that additional investment beyond the technical assistance outlined in this proposal will be necessary to capture these global benefits. All of the components of this project are meant to lay the foundation for this potential significant investment.

11. In order to respect the principle of incremental costs, two steps have been taken in the design of this project. First, GEF funding is not being requested for Component 1. Second, GEF grant funds are targeted only for the technical assistance elements and training. Any funds to be used in implementing the follow-on investments will have to be obtained independently from non-GEF sources.

12. This project is not intended to finance investments in energy efficiency equipment, but to remove barriers that will, among others, enable follow-up investments to take place. Cost recovery on barrier removal is, however, impossible and therefore GEF involvement is needed. Once the barriers are removed, potential and anticipated follow on investments in "win-win" projects could trigger the curtailing of as much as 11.73 $MTCO_2$/year. Domestic benefits associated with the project will be the creation of a strong national institution that will act as an incubator for energy services companies and other investments in energy efficiency. Moreover, national benefits will also include the establishment of a Small Power Group that will assist in the establishment of power purchase agreements for cogenerators and supply advice and technical assistance to interested parties.

13. As stressed before, this project will result in the removal of barriers in order to enhance energy conservation. Even though it will have no direct impact on the deferral of capacity expansion, it will, to the extent that the activities are successful and the anticipated

follow-up investments materialize, have an in-direct impact on capacity expansion plans. Once the barriers are removed, the potential follow on investments in "win-win" projects could result in significant reductions in CO2 emission through deferral of capacity expansion.

TOTAL PROJECT COSTS:

14. The costs of this project are estimated to be $5.895 million, of which $4.11 million is being requested from GEF. As part of the baseline, $800,000 will be obtained as co-financing by the UNDP, $985,000 is cash contribution from the Government of Egypt, while the remaining £600,000 ($178,000) represents the contribution (in kind) of the Egyptian government.

15. The cost of Component 1 is estimated at $ 860,000 which is going to be nearly entirely financed by the UNDP (except 60,000 provided by GoE) as part of the sixth cycle country programming. The cost of Component 2 is estimated at $ 4,254 million of which $3.47 million is requested from the GEF. The remaining $ 784,000 for this component will be contributed by the Government of Egypt. The cost of Component 3 is estimated at $ 781,000 of which $ 640,000 is requested from the GEF. The remaining $ 141,000 will be contributed by the Government of Egypt.

INCREMENTAL COST MATRIX

Component	Cost Category	Cost (US$m)	Domestic Benefit	Global Environmental Benefit
Component 1: Loss reduction, load shifting & load mgt. in Unified Power System	Baseline	US$860,000[1]	Continuation of Price Reform Potential savings of equivalent of 0.17 Mtoe per year	Decrease in consumption due to pricing and potential reduction CO2 emissions (following anticipated follow-up investment) by .MT/year
	Project	US$860,000	Fuel savings potential of 0.17 Mtoe per year	Decrease and reduction same as above
	Increment	0		
Component 2: Energy Conservation & Engineering Support Services	Baseline	US$784,000[2]	Unsustainable utilization of domestic energy resources & needless capacity expansion	Continuation of increase in level of current emissions due to inefficiencies
	Project	US$4,254,000	The creation of a strong national institution acting as an incubator for ESCO activity and other energy conservation investments & the establishment of codes and standards.	Potential reduction of CO2 emissions (following anticipated follow-up investment) by up to 8.25 m T/year
	Increment	US$3,470,000	The creation of a strong national institution acting as an incubator for ESCO activity and other energy conservation investments & establishment of codes and standards.	Potential reduction of CO2 emissions (following anticipated follow-up investment) by up to 8.25 m T/year
Component 3: Cogenerated Power	Baseline	US$141,000[3]	Unsustainable use of domestic energy resources	Unnecessarily high CO2 emissions
	Project	US$781,000	The establishment of the Small Power Group that will assist in establishment of power purchase agreement and will provide advice and technical assistance to interested parties.	Potential reduction of CO2 emissions (following anticipated follow-up investment) by 3 Mt/year helping defer capacity expansion
	Increment	US$640,000	The establishment of the Small Power Group that will assist in establishment of power purchase agreement and will provide advice and technical assistance to interested parties.	Potential reduction of CO2 emissions (following anticipated follow-up investment) by up to3 m T/year
Totals	Baseline	US$1,785,000		
	Project	US$5,895,000		
	Increment	US$4,110,000	Removal of barriers to a better energy conservation and to utilization of the cogeneration potential of Egypt.	Total Potential CO2 emission reduction of up to 11.73 MT CO2/year

1 The US $ 800,000 will be co-financed by UNDP.
2 The US $ 784,000 will be a contribution from the Government of Egypt.
3 The US $ 141,000 will be a contribution from the Government of Egypt.