PN-ACS-064
118898

DRAFT

Moving Markets for Energy Efficiency (MMEE)

Egypt Country Report

Emad Hassan
Bechtel Consulting
March 1999

23865-103-0003

Table of Contents

Page

EXECUTIVE SUMMARY 3

1. GENERAL AND ECONOMIC PROFILE 6

2. THE ENERGY SECTOR 7

3. ENERGY RESOURCES AND CONSUMPTION 7

4. THE NEED FOR ENERGY EFFICIENCY 9

5. ENERGY EFFICIENCY MARKET POTENTIAL IN EGYPT 10

6. ENERGY EFFICIENCY MARKET BARRIERS AND DRIVERS 11

6.1 Technical Barriers 12
6.2 Economic Barriers 12
6.3 Financial Barriers 12
6.4 Institutional Barriers 13
6.5 Market Drivers for Energy Efficiency 13

7. THE ROLE OF THE PRIVATE SECTOR IN ENERGY EFFICIENCY 14

7.1 The Egyptian Energy Service Business Association (EESBA) 15
7.2 The Federation of Egyptian Industries 15

8. PAST AND CURRENT ENERGY EFFICIENCY ACTIVITIES 15

8.1. The Energy Conservation and Environment Project (ECEP) 15
8.2. Assessment of the Feasibility of the ESCO Approach 16
8.3. The Demand Side Management (DSM) Pilot 17
8.4. The IFC - SME Compact Fluorescent Lighting Pilot Project 19
8.5. The National Energy Efficiency Strategy (NEES) 19
8.6. The GEF/UNDP Energy Efficiency Project 20

Making Markets for Energy Efficiency (MMEE)

Egypt Country Report

Executive Summary

This report summarizes the current energy efficiency market conditions in Egypt as one of the target countries for future efforts under the "Making Markets for Energy Efficiency" (MMEE) project. MMEE is a project sponsored by the Office of Energy, Environment, and Technology in the United States Agency for International Development (USAID) Global Bureau's Environment Center. The project is designed to achieve long-term market transformation through an enabling framework that stimulates further delivery of energy efficiency in developing countries.

The Egyptian economy has been growing steadily since the Government of Egypt adopted an economic structural reform in 1991 toward liberalization and market driven policy. Efficient use of energy resources has been the topic of discussion among policy makers due to concerns over the future energy balance in Egypt. The industrial business community is growing and is in need of energy efficiency to sustain regional and international competitiveness. Additionally, Egypt is challenged with an environmental burden due to the high level of pollution in urban areas which caused the Government of Egypt (GOE) to adopt a climate change action plan of which energy efficiency is an essential element.

As a major recipient of USAID funding exceeding $2 billion annually, Egypt also implemented energy efficiency pilot projects, the largest of which was the 9-year USAID-funded Energy Conservation and Environment Project "ECEP". The Project concluded in September 1998 after completing 30 demonstration projects in public and private industries generating 130,000 tons of oil equivalent (TOE) of annual savings valued at $15.6 million. An assessment of the economic and environmental benefits projected the economic potential for future savings as a result of replicating technologies demonstrated by ECEP to range from 700,000 to 2,500,000 tons of oil equivalent (TOE).

The technical market potential for energy efficiency investments including equipment and services ranges between $2.3 and $4.9 billion most of which is in the industrial sector. Of this estimate, $0.5 to $1.9 billion can be achieved if the ECEP demonstration technologies alone can be replicated at a national level. These investments can generate end use savings to consumers ranging from $750 million to $2.6 billion NPV over the life of the equipment or 1-3% of GDP. The associated reduction in greenhouse gas emission is estimated at 2.6-9.5 million tons of CO^2.

Target Results	Baseline Scenario	Moderate Scenario	Aggressive Scenario
Energy Savings	0.70 TOE	1.50 MTOE	2.50 MTOE
Emission Reduction	2.6 MT CO^2	5.7 MT CO^2	9.5 MT CO^2
Equip & Services Market	$0.446 Billion	$1.1 Billion	$1.9 Billion
Consumers NPV Savings	$0.764 Billion	$1.6 Billion	$2.6 Billion

Potential for economic and environmental benefits in Egypt

The existing Gore-Mobarak initiative for building further cooperation between the two countries focuses on health, education, and the environment thus forcing environmental concern as a priority on the political agenda. As a result, Egypt is currently starting a USAID-funded 4-year program to institute and implement an environmental policy program aimed at improving its environment. The program is called the Egyptian Environmental Policy Program (EEPP) and is implemented through the Egyptian Environmental Affairs Agency (EEAA), the Organization for Energy Planning (OEP), and the Tourism Development Authority (TDA). Included in the EEPP is a mandate to create a National Energy Efficiency Strategy for Egypt to help its economic development and meet its Climate Change goals.

Although several energy efficiency activities have been implemented over the past decade, and despite the Government perceived support to efficiency, major market barriers still exist and need to be overcome before any national impact can be realized.

Financing energy efficiency projects in Egypt has not been fully accepted by most financial institutions yet due to, like most places, the lack of understanding of how energy efficiency works and therefore, the reluctance to view it as a safe and reliable investment. Most lending practices were focused on short-term asset-based financing which is dramatically different from energy efficiency applications. However, limited cases currently in development suggest that enough attention exist among several local and joint venture banks to warrant an awareness campaign to various investment vehicles. The Capital market in Egypt is growing rapidly and providing many opportunities for creative investments.

The private sector is growing and is currently influencing the economic development of Egypt. Most business owners understand the economic and environmental benefits of energy efficiency. There is a limited base of energy service providers that emerged over the past few years, but yet there is not enough capacity within this group to either meet demand or, more importantly, raise the confidence of the business and the financial community to implement energy efficiency aggressively.

The Egyptian energy market appears sufficiently attractive for the establishment of an energy services industry. Current microeconomics and industry indicators

suggest that Egypt's economy offer a suitable climate for the existence and growth of Energy Service Companies (ESCOs). Using Energy Performance Contracting (EPC) and third party finance will increase the penetration of energy efficiency applications while providing customers with cost-effective energy solutions and measurable results.

A new energy services industry association has come about as a culmination of ECEP's efforts in stimulating private sector interests in energy efficiency. The Egyptian Energy Service Business Association (EESBA) has 14 members of various energy service providers including ESCOs and equipment and service suppliers. EESBA has been recently invited to participate in various public efforts of planning and designing new policies.

With its stable economy, expanding industrial base, growth of real estate development, depleting resources of fossil fuel, aspirations of the Government to export electricity to neighboring states, Egypt presents a fertile soil for energy efficiency. Furthermore, the growing momentum of the private sector in driving the economy offers a strong vehicle to facilitate the creation of an energy efficiency industry capable of meeting demand. In fact, Egypt could potentially emerge as an influencing energy efficiency center in the Middle East region.

1. General and Economic Profile

Egypt is located on the north eastern corner of the African continent overlooking the Mediterranean Sea on its north borders and the Red Sea on the eastern borders. Neighboring Sudan and Libya on its southern and western borders respectively, Egypt spreads over one million square kilometers of which only 4% are occupied. The 1997 official figures indicated that the total population was 61.5 million people with an average growth of 2% per year.

In 1991, the GOE has committed to an economic structural reform to liberalize the economy and move toward market-based policies, with an increased role for the private sector. The results of this reform has stabilized the economy over the past 8 years with a consistent increase in GDP in the range of 4-7% and a reduction in budget deficit to its all time low.

According to an economic report by EFG-Hermes Securities Brokerage[1], the total Gross Domestic Product (GDP) has grown from a $60.8 billion in 1992 to $73.4 billion in 1997 with an estimate of $77 billion for 1998 and a 6% growth for the next 2 years. The 90-day Treasury Bill rate has seen a significant reduction since 1992 dropping from 17.7% to less than 9% in 1997. Similarly, inflation was reduced from 21% in 1992 to 6.2% in 97, with a forecast of further reduction to 4% through 2000.

Budget deficit was reported at below 1% of GDP, and the currency exchange rate has been stable since 1991 at 3.4 Egyptian Pounds to the U.S. Dollar. Major sectors contributing to the GDP are Industry & Mining, Agriculture, Petroleum, Trade, Finance, Insurance, Transport & communication, and construction.

Year	*1992*	*1997*	*1998*	*2000*
Population (million)	*55.2*	*61.5*	*62.8*	*65.5*
GDP ($ Billion)	*60.8*	*73.5*	*76.9*	*86.7*
90-Day T-Bill Rate	*17.7%*	*8.9%*	*8.8%*	*8.6%*
Inflation	*21.07%*	*6.2%*	*4.0%*	*4.0%*
Budget Deficit (% of GDP	*3.0%*	*0.9%*	*0.8%*	*0.7%*
Exchange Rate (L.E./$)	*3.4*	*3.4*	*3.4*	*3.4*

(Table 1) Actual and Estimated Primary Economic Indicators 1992-2000
Data Source: EFG-Hermes

The Egypt's USAID mission is considered the second largest in the world as Egypt receives over $2 billion of grants and other forms of assistance funding of which approximately $800 million dollars are non-military funds.

[1] Egypt Country Report, EFG-Hermes, September 1998

2. *The Energy Sector*

There are three public agencies involved in the planning, production, distribution, and delivery of energy in Egypt:

- The Egyptian Petroleum Corporation (EGPC), responsible for the production and refining of crude oil, and the production and distribution of natural gas. However, distribution of natural gas is currently in transition to the private sector. EGPC reports to the Ministry of Petroleum.

- The Egyptian Electricity Authority (EEA), responsible for the generation and distribution of electricity and it has 7 geographic generation and distribution companies. The EEA reports to the Ministry of Electricity and Energy.

- The Organization for Energy Planning (OEP), responsible for long-term planning of energy use, the collection and reporting of primary and final energy data, and the development of a National Energy Efficiency strategy. The OEP reports to the Ministry of Petroleum.

3. *Energy Resources and Consumption*

Egypt relies mainly on crude oil and natural gas for its primary energy production with an insignificant amount of hydropower and coal. In 1997-98, the Country's energy production reached 57.6 MTOE, of which approximately half or 28.3 MTOE have been consumed for end use industrial, commercial, residential, agricultural, transportation, and other Government and utilities needs. The other half is used for export partners' share of crude oil, and electricity and petroleum sectors consumption[4]. Although the production of primary energy resources has dropped below the 1996-97 level by 1.64%, final or end use energy consumption has grown by over 8%.

1997-98 Primary Energy Source	MTOE	Ratio of Total
Crude Oil	40.091	69.61%
Natural Gas	14.757	25.62%
Hydropower	2.681	4.65%
Coal	0.067	0.12%

(Table 2) Primary Energy Production in Egypt 1997-98
Data Source: OEP

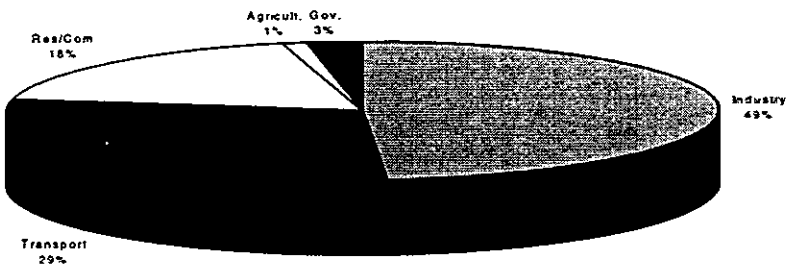
[2] Energy in Egypt, Organization for Energy Planning's Annual Report, 1997-98

The following table provides a breakdown of energy end use by sector for both 1996-97 and 1997-98 years with growth rate ratio in each.

Year	Industry	Transport	Res/Com	Agricult.	Gov/Util.	Total MTOE
1997-98	13.782	8.236	5.202	0.317	0.713	28.25
1996-97	12.766	7.576	4.84	0.304	0.626	26.112
Growth	7.95%	8.71%	7.48%	4.28%	13.9%	8.18%

(Table 3). Final Energy Consumption in Egypt 1996-97 & 1997-98
Data Source: OEP

The industrial sector is the primary consumer of end use energy with a 49% share (13.8 MTOE) of the total use, followed by the transportation sector with 29% (8.2 MTOE), while both the residential and commercial sectors using 18% (5.2 MTOE). The remaining 4% (1 MTOE) is used for agricultural and other Government use.



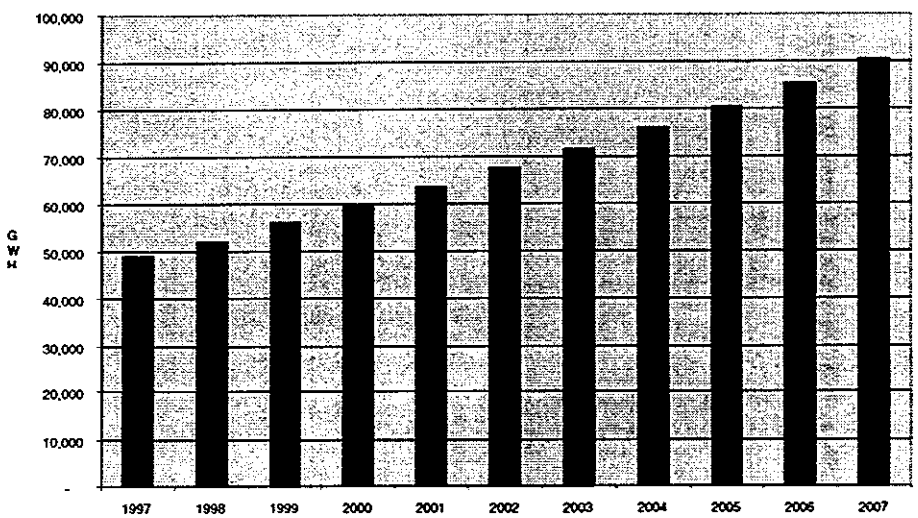
(Figure 1) Final End Use Energy Consumption in Egypt 1997-98
Data Source: OEP

The total installed electric power capacity is approximately 13,300 Megawatts (MW) of which 80% is based on natural gas and the rest is split between hydroelectric and thermal power. The Ministry of Electricity and Energy announced that it would increase capacity at the rate of 650-1,300 MW per year through 2010 to meet future demands. Electric demand is currently above 10,000 MW, and is expected to reach 12,750 by 2002, and 17,000 MW by 2007.

To minimize the capital impacts on the national budget, the GOE has allowed direct foreign investment in power generation projects. The Build, Own, Operate, and Transfer (BOOT) model allows investors to erect and operate power plants, generate, and sell electric power to the GOE at an agreed upon price for 20 years, with the right to renew for an additional 20 years. The first 650 MW gas-fired BOOT plant in Sidi Krir was signed in '98 with an international independent power producer. Commercial operation is expected in January 2002.

Electricity consumption in Egypt reached 53 billion kWh in 97-98; a 7.4% increase over the previous year. The industrial sector amounts to 42% of total, residential and commercial consume 39%, and the remaining 19% cover agricultural, and other Government and public utilities use. The growth in electric consumption is expected to continue due primarily to new development needs, and electrification of rural areas.

The EEA projects that electrical consumption will reach 90 billion kWh by 2007, representing a 100% increase over 1995 levels. Electricity end use rates range from 1.5-2 cents/kWh for large high voltage industrial plants, 4.5 cents/kWh for >500 kW demand, and 5.5 cents/kWh for most industrial customers. Commercial customers pay a tier rate up to 1,000 kWh per month above which the rate reaches 12.6 cents/kWh.



(Figure 2) Actual and Projected Electrical Energy Consumption in Egypt 1995-2007
Data Source: EEA & OEP

4. *The Need for Energy Efficiency*

Egypt's needs for energy efficiency is growing in parallel to the Country's economic growth that has been consistent since 1991 under the Government's adopted economic policy reform. Several market and policy development factors,

as well as resource-related issues contribute to such a need for efficiency.

On the market and policy development side, the gradual removal of rate subsidies, the rapid increase in real estate development and associated needs for new power, the ongoing efforts to privatize government-owned companies, and the growth of the industrial sector, have together posed an urgent need for energy efficiency.

From a resource requirement perspective, Egypt's current oil reserve is expected to last less than 15 years, and current research studies indicate that by 2010, Egypt could be a net importer of oil if current trends continue[3]. This serious trend requires policy makers to focus on alternatives or consider shifting energy dependency to natural gas that has been for sometime in abundance in several locations in Egypt.

5. *Energy Efficiency Market Potential in Egypt*

The total market potential for energy efficiency in Egypt ranges from $500,000 million to $4.9 billion[1]. A 1998 study titled "The Replication Potential of ECEP Application: An Assessment of National Energy, Economic, and Environmental Benefits"[1] provided an analysis of likely scenarios to develop for energy efficiency applications quantifying potential savings, investment requirements, and reduction in energy consumption and greenhouse gas emission. According to the Study, the technical potential for energy savings in all forms (solar, electricity, Natural Gas, Oil, and Mazout) when replicating the technologies adopted in the ECEP's demonstration projects is sized at 3.313 MTOE.

However, the study introduced three scenarios to develop in future years depending on the level of policy reform adopted. First is the "Baseline Scenario" where no new energy efficiency specific policies will be developed but ongoing tariff and energy sector reform will continue. In this scenario, a total of 700,000 TOE of energy and 2.6 million tons of CO^2 are likely to be saved requiring a total investment of $446 million and returning $746 million in NPV savings to the end users over the life of the projects.

The second is the "Moderate Scenario" which assumes that a combination of energy efficiency policies as well as a cogeneration policy will be adopted supported by GOE-sponsored awareness campaign. Total energy savings expected from this scenario are 1.5 MTOE and 5.7 million tons of CO^2 reduction requiring $1.1 billion in investment to generate $1.6 billion NPV. The last scenario is the "Aggressive Scenario" assumes further adoption of policies such as the institution of codes and standards, incentives for ESCOs, and a certification program.

---

[3] Business Monthly Magazine – "Zap Efficiency", December 1998
[4] National Energy Efficiency Strategy: Action Plan - Bechtel Consulting, May 1998
[5] The Replication Potential of ECEP Applications: An Assessment of National Energy, Economic, and Environmental Benefits – Bechtel Consulting, March 1998

Target Results	*Baseline Scenario*	*Moderate Scenario*	*Aggressive Scenario*
Energy Savings	*0.70 TOE*	*1.50 MTOE*	*2.50 MTOE*
Emission Reduction	*2.6 MT CO^2*	*5.7 MT CO^2*	*9.5 MT CO^2*
Equip & Services Market	*$0.446 Billion*	*$1.1 Billion*	*$1.9 Billion*
Consumers NPV Savings	*$0.764 Billion*	*$1.6 Billion*	*$2.6 Billion*

(Table 4) Potential for economic and environmental benefits in Egypt
Data Source: ECEP

The total energy and environmental benefits associated with this scenario are 2.5 MTOE of energy savings and 9.5 million tons of CO^2 reduction which will cost approximately $1.9 billion in products and services to implement, and is expected to return $2.6 billion NPV to end users.

The potential identified above excludes other technologies that were not included in the mix of demonstration technologies under ECEP. According to the "National Energy Efficiency Strategy: Action Plan", when all technologies are accounted for, the total technical potential for investment can be as high as $4.9 billion returning $6.8 billion NPV to consumers.

Most of the market potential is in the industrial sector, which is seeing a strong and steady growth, thus forcing the need for efficiency. The shift in the Government policy to privatize its industrial enterprises is contributing to bringing energy efficiency to the forefront. Egyptian industries export regionally and internationally, and therefore, are faced with the challenge of increasing efficiency to sustain international competitiveness.

6. *Energy Efficiency Market Barriers and Drivers*

As in many developing countries, the barriers to the spread of energy efficiency in Egypt exist in different domains. However, in the past few years several market development and economic factors began to drive the business community to at least recognize the need for efficiency. Previous USAID[6] studies have evaluated the impediments to implementing energy efficiency in Egypt in general and to market

[6] Financing Energy Efficiency Projects, ECEP, August 1995

entry for ESCO's in particular. These barriers along with more current views on the energy market are summarized below.

6.1 Technical Barriers

- High cost of energy efficiency equipment, the majority of which are imported, lack of end-use information.
- Difficulty in measuring energy savings particularly in industrial sectors, where most of the potential exists.
- Lack of skilled professionals operating industrial. Equipment.
- Specific to the ESCO entry is a legal barrier related to the current lack of knowledge of performance contracting among the legal profession. Additionally, the enforcement of the terms and conditions of performance contracts can not be assured.

In general, the market lacks the technical depth and sophistication to allow for the adoption of energy efficiency as a normal technical practice.

6.2 Economic Barriers

- Distorted end-use energy prices due to subsidies to certain sectors of the economy.
- Most Egyptian industries are considered "cottage industries" that don't typically have the capital resources to invest in efficiency. The presence of a large used equipment market usually appeals to this sector of industries.

6.3 Financial Barriers

- Lack of available compatible financing to ESCO projects is caused primarily by the mode of investment of the financial industry. Commercial banks and investment funds in Egypt have been investing in real estate development, tourism establishments, and the stock market with unusually high return in short periods. Additionally, most of these investments are collateral-based and are invested based on the credit worthiness of the borrowing company not on the cash flow of the project.
- Available project oriented lending is mostly short-term with high interest rates on local currency.
- Although Leasing is considered the most compatible vehicle to financing energy efficiency, it has been authorized by law in late 1995, and has since been oriented to commodities with salvage value.

6.4 *Institutional Barriers*

- Lack of energy efficiency strategy and the presence of government or private sector agencies to monitor and enforce such policies.
- Institution of minimum energy efficiency standards, appliances labeling and codes, and new construction maximum levels of energy consumption are absent in the energy market in Egypt.
- No financial incentives such as tax holidays and favorable custom duties for energy efficiency projects.

The solution to growing an energy efficiency market is in developing an integrated approach that can produce tangible and more sustainable results.

6.5 *Market Drivers for Energy Efficiency*

Just as much as there are barriers to impede the wide adoption of energy efficiency in Egypt there are drivers that create a bigger than ever before need for efficiency. Several factors such as the need for new power to meet future development, the privatization of government industries, and the growing demand on improving the environment are all posing a serious and immediate need for energy efficiency. The following are market drivers creating demand for energy efficiency:

- ❑ Expansion of private sector industrial sector and the export of Egyptian industries requiring efficiency sustain regional and international competitiveness.
- ❑ Privatization of Government industrial enterprises that are mostly 30-50 years old, and in desperate need of renovation and improved efficiency to improve their financial health. Although the GOE has committed to a quicker privatization schedule, the majority of public industries are expected to be fully privatized over the next 5 years.
- ❑ The increase in new urban development and tourism establishments will require efficiency to cut running costs.
- ❑ The GOE plans to export electricity to neighboring states to increase its foreign currency revenue. This aspiration is encouraging the EEA to promote energy efficiency especially in sectors where revenue collection has been a problem.
- ❑ The concern over depleting oil reserves and the abundance of natural gas resources is forcing policy makers to consider shifting power demands to natural gas instead of oil; increasing efficiency at the source level.

- The adopted climate change action plan places energy efficiency on the priority map of policy makers.

7. *The Role of the Private Sector in Energy Efficiency*

The private sector in Egypt has gained the respect of policy makers and local as well as international financial institutions since the structural economic reform in 1991. As a natural evolution with privatization of public enterprises, the private sector has taken a very active role in expanding the industrial base thus raising the confidence of financial institutions to provide substantial financing to many infrastructure and development projects. Along with this industrial growth comes a concern about competitiveness. Private sector roles in the adoption and expansion of energy efficiency relate to both the provision of energy services and to the consumption of end use energy.

As users of energy resources, industrial business owners are well aware of the cost of energy relative to their end products; however, there still exists a lack of understanding of investment in energy efficiency.

Up until recently, most industries were either public sector or family-owned businesses where decisions on operations and maintenance of energy-using equipment were made by technicians and medium education labor. This was due primarily to the inexpensive cost of energy supply. With the rise in energy costs, the gradual removal of subsidy, and the move toward privatization of Government enterprises, most business owners as well as Government enterprises are now more sensitive to energy consumption but have not been introduced to choices to reduce consumption without high capital investments.

As providers of solutions to these business owners, the private sector has not yet reached a reasonable level of maturity to catch the attention of industrialists or investors to view energy efficiency as a competing investment vehicle.

As a result of ECEP and its capacity building efforts, there exists now a critical mass of private energy service providers including ESCOs, equipment manufacturers, service contractors, energy engineering firms, as well as legal and financial consultants ready and trained to create a limited supply to the market.

Many industries are beginning to take advantage of the active capital market and start offering all or a portion of their equity on the stock exchange. This new business culture is more accepting of long term financing schemes, and other creative business ventures.

7.1 The Egyptian Energy Service Business Association (EESBA)

As a non-government organization, EESBA represents the business interests of private companies offering products and services to the energy efficiency market in Egypt. It is established to function as a forum for professionals involved in the energy efficiency business to facilitate information exchange, foster working relationships between members, and create an information link to international organizations. EESBA in intended to address current market barriers facing the energy efficiency business community and work towards solutions.

EESBA was formed in early 1998 as an informal group of interested parties and evolved into a fully registered NGO in January 1999 with 15 full members, and approximately similar number as affiliate members.

The organization includes 2 main categories within its full memberships: Turnkey ESCOs, and Vendors/Suppliers of products and services. The affiliate membership includes, consulting and engineering firms, legal / business / financial consultants, financial institutions, public energy-related agencies, and other stakeholders.

EESBA is considered the voice of the private sector for energy efficiency matters and therefore, is currently participating in a GOE effort to develop long-term policies for energy efficiency.

7.2 The Federation of Egyptian Industries

The FEI is a consortium of industrial companies working towards protecting and organizing the Egyptian industries in their business efforts locally and internationally. It has been instrumental in representing local industries in discussions on international trade agreements, environmental improvements and compliance, and on competitive issues such as "dumping". As an organization, it also can play an important catalytic role in introducing energy efficiency benefits to its potentially 18,000 members. The industrial sector is the major consumer of end use energy totaling approximately 13.8 MTOE.

8. Past and Current Energy Efficiency Activities

8.1. <u>The Energy Conservation and Environment Project (ECEP)</u>

Several energy efficiency activities have taken place in Egypt beginning in mid eighties, but only since the beginning of this decade is when actual measurable results have been realized. The largest energy efficiency project came about in 1990 when the local USAID mission initiated a demonstration project of industrial

energy efficiency technologies, offering major financial assistance to customers interested in upgrading their existing equipment to achieve energy reduction.

Due to its success in stimulating multiple industrial customers, the "Energy Conservation and Environment Project" (ECEP) was continued through September '98 totaling $67 million in funding. In its 9-year life, ECEP completed thirty (30) demonstration projects in public and private industries generating 130,000 TOE of energy savings valued at $15.6 million to end users.

As previously mentioned, an assessment of the economic and environmental benefits projected the economic potential for future savings as a result of replicating technologies demonstrated by ECEP to range from 700,000 to 2,500,000 tons of oil equivalent (TOE) creating a potential investments of $0.5 to $1.9 billion.

ECEP also provided technical training to over 5,000 industry professionals from both the public and private sectors of the energy market, and provided 38 training manuals on various technologies and market applications. Furthermore, ECEP organized 2 main Demand Side Management (DSM) conferences in March 1995 and in December 1997. During its existence, ECEP sponsored several study tours to local industry practitioners to the U.S. resulting in an increased knowledge of energy efficiency practice and the development of information bridges with relevant U.S. organizations.

The ECEP's efforts in stimulating the interest of the private sector in providing energy services were evident by the formation of the local ESCO association EESBA. ECEP also assisted in developing awareness building campaigns to help the emerging association market its services. As a result of ECEP's Partnership Initiative, a national energy efficiency strategy is now being developed. ECEP provided assistance to the OEP in developing an action plan to realize the economic and environmental benefits of ECEP technology commercialization and private sector market conditioning.

8.2. Assessment of the Feasibility of the ESCO Approach

Under the direction of the ECEP, an assessment was conducted in 1997 to evaluate the feasibility of introducing the ESCO approach in Egypt. To complete this assessment, 2 local consulting firms, Allied Business Consultants (ABC), and The International Investment Advisor (TIIA) were retained to evaluate the business and financial climate in Egypt to determine the applicability of the ESCO model. Additionally, a local law firm, Hashem, Ibrahim and Tawfik (HI&T) evaluated relevant environmental and financial laws, developed proposed performance contracts, and identified the documents necessary for use in association with such contracts. U.S. ESCO experts helped guiding this effort.

The approach used in this evaluation, and in developing the necessary contracts relied on 1) actual market data obtained through interviews and discussions with

industry players, and 2) information available in reports, articles, and studies on the ESCO approach and the related experience in the U.S. and other countries.

This dynamic interaction between the local firms was very beneficial to the final results of this report as most issues were evaluated more objectively and without the bias of a certain discipline. Additionally, there was a great deal of learning and exchange of information and experience that helped increase the consultants' understanding of the ESCO industry.

Main Findings

The consultants identified a number of observations associated with the development of an ESCO industry in Egypt such as:

- Barriers to performance contracting exist due to the novelty of the idea, but these barriers are NOT insurmountable. There is enough momentum and enthusiasm in the market place about the approach, but the implementation of the concept and the associated risks are not yet understood.
- A proof-of-concept type pilot is essential to demonstrate the concept and further defines the process.
- As the industry matures, problems, mistakes, and challenges are very likely to occur. It is critical to provide the necessary guidance and direction to these emerging activities to insure sustainability.
- Further efforts are needed to convince banks and other lenders of the profitability of financing energy efficiency projects. Most lending activities are geared toward corporate finance and no experience in project finance.
- The stock market is growing rapidly and offers a good forum for issuing equity or bond funds to finance ESCO projects.
- Public sector companies are good candidates for ESCO applications due to available financing from their holding companies.
- Post installation activities such as equipment commissioning and savings verification are critical to the success or failure of ESCO projects.
- Performance contracts, whether done under a Shared Savings or a Savings Guarantee approach, need to be simplified and developed in a manner that protects both ESCOs and customers while encouraging participation and avoiding legal complications given the limited familiarity with performance contracting in Egypt.

8.3. The Demand Side Management (DSM) Pilot

With the assistance of the ECEP, a coalition of six government agencies and energy suppliers led a 2-year Pilot Program to test Demand Side Management (DSM). An interagency protocol signed in May 1996, announced the initiation of this pilot uniting the efforts of ECEP, the Egyptian Electricity Authority (EEA), the

Alexandria Electricity Distribution Co. (AEDC), and the Organization of Energy Conservation and Planning (OECP and now known as OEP).

The DSM pilot program was designed as much for team building and training among the four local organizations as to develop experience in identifying and implementing energy efficiency and peak load reduction projects. The central effort involved energy audits at 18 primarily industrial facilities, selection of DSM projects, followed by EPC and monitoring of project results. The pilot partners participated in classroom and on-the-job training in all facets of the planning and implementation process.

The energy audits, in plants of all industries ranging in size from 1 MW to 200 MW of peak load, identified an average of 26% energy savings potential. One-third of the savings potential was from projects that cost less than $300,000, with average pay back on investment of one year. Project types included steam trap replacement, condensate return improvements, lighting upgrades, and a modernized vacuum pump system. Work on these projects helped the local organizations to develop core staff that are now developing new projects independently.

The DSM pilot program also initiated market studies and related training programs to identify priorities for future energy efficiency initiatives on a national scale. These studies were contracted to local firms and supplemented with training and supervision, to further develop Egyptian capabilities in market assessment and program planning. Findings of the studies included the following:

- *Over 1,000 MW of high-return cogeneration potential.* Assessments in 9 plants indicated an average 43% return on equity for cogeneration projects taking advantage of Egypt's low-cost gas and existing steam needs. Half the potential is in the refining and textile sectors. Regulations on power sales to the grid must be liberalized to realize the potential.

- *Opportunities to reduce lighting effect on peak load.* Egypt's power system peaks in the evening, and lighting contributes 20% or more to peak load. A market study indicated that if two bulbs were replaced with CFLs in each home, this would reduce peak load by over 1,100 MW. While CFLs are currently too costly in Egypt for the average household, a pilot project showed that consumers were willing to buy them via installment payments in their electric bill, still getting a net bill saving due to the energy benefits. The local utility benefits also because of the cost to serve the average (low-income) household is less than the revenue generated.

- *Low-cost electric motor improvements.* Poor motor repair methods and materials increase both operating costs and downtime in Egyptian industrial plants. A market study confirmed that given the excessive efficiency losses in motor repair, failed motors up to at least 100 hp would be more economically replaced with high efficiency motors than being repaired. Motors account for 60-80% of electricity

consumption: motor efficiency improvement would also benefit the power system. The DSM pilot program also established a motor testing lab and training program to improve motor repair practices.

8.4. The IFC - SME Compact Fluorescent Lighting Pilot Project

In 1996, the International Finance Corporation (IFC), signed a loan agreement with EL Sewedy Electrical Supply; a local Egyptian ESCO, to implement a Compact Fluorescent Lighting (CFL) performance-based pilot project in commercial applications. The pilot provided an incentive for El Sewedy as a Small/Medium Enterprise (SME) to promote and sell $500,000 worth of CFLs to commercial establishments, monitor the generated savings, and insure that clients pay back after an 18-monht grace period. El Sewedy can retain almost half of the loan proceeds if projected savings materialize and pilot customers paid back the loan.

8.5. The National Energy Efficiency Strategy (NEES)

As a result of the action plan mentioned above, a team of eleven (11) stakeholder public and private sector agencies and organizations has been recently formed to develop a long-range energy efficiency strategy for Egypt. The team is known as the "Energy Efficiency Council" (EEC), and will focus its efforts on resolving existing barriers to expanding the energy efficiency market, either through business initiatives or by evaluating and recommending policy and legislation reform. The main objective is to improve energy use and reduce greenhouse gas emissions in the Country. Efforts will cover policy reform, capacity building, and promotions and outreach.

Participating agencies in the "Energy Efficiency Council" are:

1. The Organization for Energy Planning (OEP)
2. The Egyptian Electricity Authority (EEA)
3. The Egyptian Petroleum Corporation (EGPC)
4. The Egyptian Environmental Affairs Agency (EEAA)
5. The New and Renewable Egyptian Agency (NREA)
6. The Federation of Egyptian Industries (FEI)
7. The Egyptian Energy Service Business Association (EESBA)
8. The General Organization for Industrialization (GOFI)
9. The Public Works & Water Resources
10 Egyptian Organization for Standards (EOS)
11 Ministry of Transportation

8.6. The GEF/UNDP Energy Efficiency Project

In August 1998, the Untied Nations Development Program (UNDP), on behalf of the Global Environment Facility (GEF), signed an agreement with the Egyptian Electric Authority (EEA) to implement a $5.8 million project for energy efficiency over a period of 4.5 years. The project has 3 components: the first is to improve the efficiency of the transmission and distribution system, the second is to design a DSM program at the utility level and encourage the development of private sector ESCOs. The last component is for the evaluation of policy related to cogeneration for industrial applications.