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ENERGY EFFICIENCY MARKET ASSESSMENT FOR EGYPT

DRAFT



Moving Markets for Energy Efficiency **MMEE**

A Project Sponsored by the USAID Global Bureau's Environment Center
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I. EXECUTIVE SUMMARY

This report provides an assessment of current energy efficiency market conditions in Egypt as one of the selected countries for the “Moving Markets for Energy Efficiency” (MMEE) project: 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. MMEE 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 (GOE) adopted an economic structural reform in 1991 towards liberalization and market driven policy. Efficient use of energy resources has been the topic of discussion among policy makers due to concerns over 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 GOE to adopt a climate change action plan of which energy efficiency is an essential element.

As part of its substantial USAID funding (in excess of \$2 billion annually), Egypt has implemented one of the largest energy efficiency projects in the industrial sector: the Energy Conservation and Environment Project “ECEP”. The Project, which started in 1990 and concluded in September 1998, resulted in 30 demonstration projects in public and private industries resulting in 130,000 tons of oil equivalent (TOE) of annual savings valued at \$15.6 million. An assessment of the economic and environmental benefits indicated that the economic potential for future savings as a result of replicating technologies demonstrated by ECEP to ranged from 700,000 to 2,500,000 tons of oil equivalent (TOE).

The energy efficiency market potential in Egypt is substantial. Estimates for investment potential in equipment and services range 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 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 CO².

The existing “Gore-Mobarak” initiative for building further cooperation between the U.S. and Egypt focuses on health, education, and the environment thus forcing environmental concern high 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 to meet its Climate Change goals.

Target Results	Baseline Scenario	Moderate Scenario	Aggressive Scenario
Energy Savings	0.70 MTOE	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

Despite the various energy efficiency activities implemented in Egypt over the past decade, and despite the Government perceived support to efficiency, major market barriers still exist. They range from institutional to technical, economic, and financial barriers preventing the realization of the huge present savings potential.

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

The business community in Egypt is becoming conscious of the cost of energy as a percent of their operating costs. However, there is a lack of awareness of the economic and environmental benefits attributable to energy efficiency. This emerging interest in energy cost reduction will rise as Egyptian industries face more competition globally. However, there is a limited base of energy service providers which is not enough to meet future market demand, assuming the removal of market barriers. More importantly, the need for credible service providers in the market will raise the confidence of the business and the financial community to implement energy efficiency more aggressively.

In general, the Egyptian energy market appears sufficiently attractive for the energy services business. 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 cost-effective energy solutions and measurable results.

A new energy services industry association has been formed recently as a culmination of the 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 type including ESCOs, equipment vendors, and other service suppliers. EESBA has been recently invited to participate in various public efforts of planning and designing new policies including the development of a the National Energy Efficiency Strategy.

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.

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

II. COUNTRY PROFILE

Egypt is located on the north eastern corner of the African continent overlooking the Mediterranean Sea on its northern 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 census figures indicated that the total population reached 61.5 million people with an average growth of approximately 2% per year.

A. Economic Background

In 1991, the GOE had 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 to 7% and a reduction in budget deficit to an all time low.

According to an economic report by EFG-Hermes Securities Brokerage¹, 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 the end of 2000.

Budget deficit was reported at below 1% of GDP, and the currency exchange rate has been stable since 1991 at 3.40 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

¹ Egypt Country Report, EFG-Hermes, September 1998

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 funding assistance of which approximately \$800 million dollars are channeled into non-military sectors. The existing "Gore-Mobarak" initiative for building further cooperation between the U.S. and Egypt focuses on health, education, and the environment thus forcing environmental concern high on the political agenda.

B. The Energy Sector

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

- 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 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.
- New and Renewable Energy Authority (NREA) is chartered with expanding solar and wind energy generation. The NREA 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.

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, electricity, and petroleum sectors consumption⁴. 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%.

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

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%

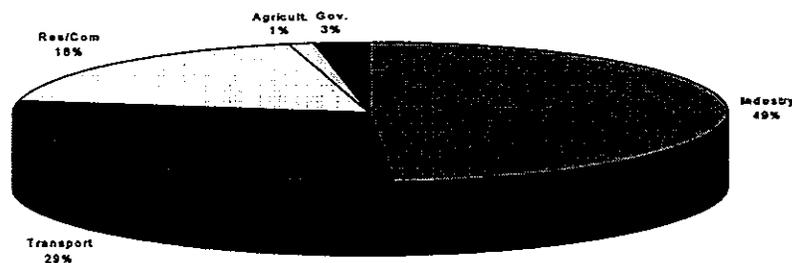
(Table 2) Primary Energy Production in Egypt 1997-98 --- Data Source: OEP

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.



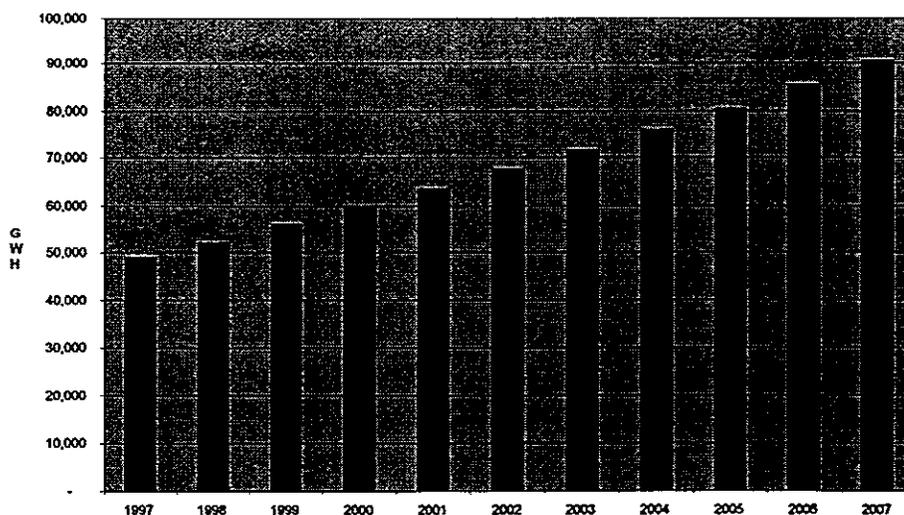
(Figure 1) Final End Use Energy Consumption in Egypt 1997-98 --- Data Source: OEP

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 build and operate power plants and sell their 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 1998 with Intergen: an international independent power producer. Commercial operation is expected in January 2002. The second and third Boot plants (also 650 MW each) were awarded to Electricity De France (EDF).

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

The Need for Energy Efficiency

Egypt's needs for energy efficiency is expected to follow 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 continue³. This serious trend requires policy makers to focus on alternatives or consider shifting energy dependency to multiple sources such as natural gas and renewable energy.

³ Business Monthly Magazine – “Zap Efficiency”, December 1998

III. ENERGY EFFICIENCY PROGRAMS AND POLICIES

A. Current and Past Energy Efficiency Activities

A.1. The Energy Conservation and Environment Project (ECEP)

Several energy efficiency activities have taken place in Egypt since the 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 for 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. The 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.

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 95 and December 97, and sponsored several study tours for 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.

A.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) 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.

Main Findings

The local 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.

A.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) application in Egypt. 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 Planning (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.

A.4. The IFC - SME Compact Fluorescent Lighting Pilot Project

As part of the Small and Medium Enterprise SME program of the Global Environment Facility (GEF), the International Finance Corporation (IFC) initiated a pilot project in 1997 with El Sewedy Company; an established electric supplier in Egypt, to improve lighting efficiency in small and medium commercial buildings. The main goal of the pilot was to test the effectiveness of the equipment suppliers in increasing the penetration of energy efficient measures in the market. The pilot was designed to target replacement of incandescent lighting with high efficiency Compact Fluorescent Lamps (CFLs) whenever applicable.

In spite the economic attractiveness of CFLs, the high first cost of the lamps compared to their incandescent counterparts seem to have limited the wide spread of CFLs in the market. This pilot was an attempt to investigate one approach to overcome this barrier.

The Pilot was designed to provide financial incentive to El Sewedy (the local equipment supplier) to market and install CFLs in small and medium commercial establishments with a total investment of \$500,000 over a period of 2 years. Funding for this initiative was made available to El Sewedy on a temporary loan basis at a low interest rate of 4% per annum.

The IFC loan was made to EL Sewedy in 2 annual payments of \$250,000 each over the course of the pilot life. These payments were used by El Sewedy in marketing the project, calculating savings, procuring the lamps, installation, and finally monitoring performance and verification of projected savings.

In addition to the regular supplier/contractor role, El Sewedy also funded 25% of the capital investment requirement of the projects with the loan amount covering the remaining 75%. Once installation completed in each facility, El Sewedy collected 4 post-dated checks from the customer to be posted quarterly over a one year period following installation. For his 25% contribution, El Sewedy was entitled to a first-out right of the post-dated payments. The following 3 payments went to pay off the loan amount.

As a reward for implementing the pilot and tracking its performance, El Sewedy was entitled to performance payments equivalent to 50% of customer payments for each completed project after payments are posted. These incentives are deducted from the outstanding loan balance due to the IFC.

Results:

- The pilot focused its application on the tourism sector and some department stores. Signing up small commercial establishment was not practical for the El Sewedy to provide adequate follow up on payments collection and performance.

- A total of 21 projects were implemented in 1997 and 10 projects in 1998. The reduction in participation at the second half of the Pilot was due primarily to the 1998 drop in tourism activity following the November 1997 attack on a group of tourists leaving 60 people dead.
- Even though the Pilot was designed for small and medium projects, participants included hotels, a university, department store, and some Government administrative facilities.
- During the implementation period, El Sewedy requested the addition of hotel “Card Key Switches” to disconnect power when rooms are not occupied. The IFC approved the addition.

Lessons Learned:

Financial incentives to manufacturers and suppliers resulted in stimulating their capital contribution into performance-based projects and to assuming credit risks. It also increased their marketing motivation to increase efficiency.

Small commercial projects are not attractive candidates to manufacturers/ESCOs for performance-based type projects.

A.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 inhibiting the development and growth of the energy efficiency market. The EEC intends to provide a draft strategy for Egypt’s energy efficiency map by April 2000 through proposed business initiatives and recommended 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

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- 10 Egyptian Organization for Standards (EOS)
 - 11 Ministry of Transportation

A.6. The GEF/UNDP Energy Efficiency Project

In August 1998, the United 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 receives \$4.5 million in funding from the GEF and \$800,000 of in-kind contribution from the EEA. This project is introduced to provide energy efficiency solutions to the market in various areas. It has 3 components: the first is to improve the efficiency of the transmission and distribution system. The second component is to provide energy efficiency market support to private sector ESCOs and to local electric companies including the design of DSM programs at the utility level and the establishment of an energy efficiency center. The last component is for the evaluation of policy related to cogeneration facilities for industrial applications.

B. Energy Efficiency Market Potential in Egypt

The total market potential for energy efficiency in Egypt ranges from \$500 million to \$4.9 billion¹. 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 environmental benefits. 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 introduced 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 CO² 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 and a cogeneration initiative will be adopted and supported by a GOE-sponsored awareness campaign. Total energy savings expected from this scenario are 1.5 MTOE and 5.7 million tons of CO² 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.

Target Results	<i>Baseline Scenario</i>	<i>Moderate Scenario</i>	<i>Aggressive Scenario</i>
Energy Savings	0.70 MTOE	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) Economic and Environmental Benefit Potential 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 CO² reduction with a total first

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

cost of \$1.9 billion in products and services to implement. Net present value of return to end users is expected to be \$2.6 billion.

This identified potential excludes other technologies not included in the mix of the ECEP demonstration technologies. 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.

IV. KEY MARKET BARRIERS AND DRIVERS

As in many developing countries, the barriers to the spread of energy efficiency application 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 recognize the need for efficiency. Previous USAID⁶ studies have evaluated the impediments to implementing energy efficiency in Egypt in general and to market entry for ESCO's in particular. These barriers along with more views on the energy market are summarized below.

A. Technical Barriers

- High cost of energy efficiency equipment – mostly imported products.
- Lack of end-use information and skilled professionals operating industrial equipment.
- Difficulty in measuring energy savings particularly in industrial sectors where most of the potential exists.
- 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.

B. Economic Barriers

- Distorted end-use energy prices due to cross subsidies.
- 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.

C. Financial Barriers

- Lack of available 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. 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

⁶ Financing Energy Efficiency Projects, ECEP, August 1995

1995, and has since been oriented to commodities with salvage value.

D. 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.

E. Market Drivers for Energy Efficiency

Just as there are barriers to impede the wide adoption of energy efficiency in Egypt there are as many drivers that create a bigger than ever need for efficiency. The following are market drivers creating demand for energy efficiency:

- The need for reduction of operating costs for Egyptian industries and exporters to sustain regional and international competitiveness.
- Privatization of Government industrial enterprises (mostly 30-50 years old) that are in desperate need for renovation and increased efficiency to improve financial health.
- Increase in new urban development and tourism establishments will require efficiency to meet load growth and cut running costs.
- The GOE's plan 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.

V. THE ROLE OF THE PRIVATE SECTOR

The private sector in Egypt has gained the respect of policy makers, 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 development capital. Along with this industrial growth comes a concern about competitiveness. Addressing the role of the private sector in expanding the market for energy efficiency requires a look at 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 how competitive energy efficiency investments can be compared to other options.

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 middle 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 and Government enterprises have become more sensitive to energy consumption but have not been introduced to economically attractive choices requiring less capital investments.

As providers of solutions to these business owners, the few emerging energy service companies have not yet reached a reasonable level of maturity to catch the attention of the business community to view energy efficiency as a competing investment vehicle.

As a result of the ECEP project and its capacity building efforts, a critical mass of private energy service providers including ESCOs, equipment manufacturers, service contractors, energy engineering firms has been created.

A. The Egyptian Energy Service Business Association (EESBA)

As a non-government organization (NGO), the Egyptian Energy Service Business Association (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 energy service organizations. EESBA is 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 from various sectors of the energy efficiency market and was officially registered as an NGO in January 1999 with 13 full members and as many 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.

B. The Federation of Egyptian Industries (FEI)

The Federation of Egyptian Industries (FEI) is a consortium of industrial companies working towards protecting and organizing the interests of Egyptian industries 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” and others.

As an organization, it is uniquely positioned to play an important catalytic role in introducing energy efficiency benefits to its 18,000 members. With the industrial sector being the major consumer of end use energy totaling approximately 13.8 MTOE annually, this organization is a key player in developing a strategy for energy efficiency.

VI. PRELIMINARY STRATEGY TO MOVE THE MARKET

As previously identified, there are several market drivers creating strong needs for energy efficiency. Rapid growth of the industrial base with needs to compete internationally, concerns over depletable natural energy resources, Government's plans to export end use energy regionally, and privatization of public enterprises are among the reasons why energy efficiency is slowly gaining momentum in Egypt.

Past government and donor-funded energy efficiency activities have contributed significantly to raising the awareness of the economic and environmental benefits of energy efficiency. They helped bringing the public attention to existing barriers preventing the spread energy efficiency practice, and identified solutions to overcome these barriers and to build the necessary capacity to meet market needs.

Despite the past successful efforts to increase awareness of energy efficiency and its economic benefits, the market response was too slow and never really provided the desired momentum to create a vibrant energy efficiency industry, and as such, it remained relatively inactive. As current economic conditions begin to create a need for efficiency, future efforts to move the market should be more promising.

It is clear that in order to expand Egypt's limited energy efficiency market, a sustainable strategy with long and short term aspects should be developed. While short term issues focus on immediate barriers inhibiting the growth of the energy efficiency business, long term aspects should focus on sustainability of energy efficient practices in various sectors of the economy. The strategy in general should take into account the local business culture, and should also maintain a high degree of flexibility to accommodate the changing needs of Egypt's emerging economy.

Recently, the Organization for Energy Planning (OEP) initiated a collaborative effort with 10 other public and private sector agencies to develop a national strategy for energy efficiency in Egypt. The newly launched initiative resulted in the formation of the "Energy Efficiency Council (EEC)": an enabling body representing all participating agencies at the top level. Ultimately, this Council will oversee the development of an integrated framework of policy reform and market initiatives to increase the efficiency of the economy and preserve natural depletable resources.

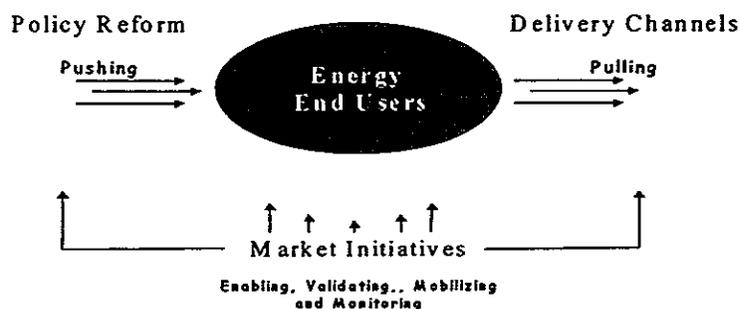
The EEC has established a target to develop a draft strategy by mid 2000. Towards this goal, several efforts are being launched to determine appropriate approaches to breaking market barriers. Coordination of customer data, public/private sector partnerships, capacity building, and awareness/outreach are examples of the efforts in progress. The MMEE project efforts are timely for Egypt now as the development of the project's tools and implementation strategies will be valuable resources to the EEC in its planning endeavor.

1. INCREASING DEMAND AND BUILDING CAPACITY

The current economic situation in Egypt indicates that demand on efficiency will increase eventually due to the planned growth of the Country's power resources and the need for regional and international trade competitiveness. However, unless an action plan is in place to push the market farther and build on this momentum, existing barriers will delay the growth of the energy efficiency market or perhaps maintain its current slow pace. The extent to which this demand will reach depends largely on the GOE's position on efficiency and how the related economic and environmental benefits are valued.

What makes Egypt a promising market for the establishment and growth of an active energy efficiency industry is that many of its policy makers, private business leaders, and financial institutions understand clearly the value of energy efficiency to the economy and therefore, are willing to promote its adoption. However, the existing energy efficiency industry is very immature and needs further development before significant market opportunities can be realized.

The proposed strategy developed for the purpose of this MMEE project depends on expediting the demand on energy efficiency at the end-use level while simultaneously building the necessary capacity of the service delivery channels and raising awareness of stakeholders until the market is fully transformed. This can be achieved through an integrated framework of regulatory and policy reform supported by enabling market initiatives.



In the short term, reforming relevant policy measures will create demand, and building the necessary capacity in the delivery channels will create an initial momentum to pull the market in the right direction. During the initial 2-4 years of implementing the strategy, market responses will provide the necessary feed back on the degree of success or challenges to some of the proposed initiatives. Implementation of the strategy should then be continually adjusted to increase effectiveness and allow for local business models to emerge.

Examples of short term and immediate actions are economic incentives to businesses adopting energy efficiency, support to private sector ESCOs and manufacturers, restructured utility tariffs and efficiency programs, and availability of compatible financing vehicles to encourage private investments.

Critical to the long term growth and continued adoption of energy efficiency, is the design of future market initiatives and policy measures focusing on expansion of market capacity to insure sustainability of the delivery mechanisms. Long term initiatives should be incrementally introduced to the market. An example of long-term initiatives is developing energy efficiency act (legislation) providing equipment minimum efficiency standards, energy codes for new buildings, and energy engineering certification for the design and engineering industry. Other examples include

- economic incentives for local manufacturing of energy efficiency equipment,
- bundling demand and supply side solicitation to service providers and independent power producers, and
- developing energy efficiency courses into educational curricula.

By far, the most important elements for the success of this strategy are flexibility, comprehensiveness, and integration of the various dimensions of its framework.

2. STRATEGY ELEMENTS

2.1. Policy Reform Measures

Changing policy to enable market transformation is always a challenging task simply because of the intricacy involved in coordinating the objectives of one policy measures with those of existing policies and regulations. Furthermore, the process of changing and amending existing laws or instituting new ones in Egypt is very complex and therefore, such changes have to be carefully studied before going through the lengthy and complicated process. Finally, unless the proposed policy is crafted in the context of the overall country's political and economic agenda, its chances of success will be very limited.

Based on the current economic and business conditions in Egypt, selected policy measures, if implemented in an integrated fashion, can produce maximum benefits for energy efficiency in Egypt. For the purpose of this discussion, policy related measures proposed to be taken by the Utility, will be included as part of the proposed market transformation initiatives due to the current intention of the Government to partially privatize the 7 distribution companies that fall under the jurisdiction of the Utility (EEA).

Several policy matters that need Government intervention have to be evaluated in light of their relevance to the overall Country's political and economic agenda. It is critical however, that these measures be integrated within a comprehensive action plan to insure effectiveness. The following is a list of these measures with brief comments on the possibility of their implementation.

2.1.1. Financial Incentives

Tax Incentives for Energy Efficiency Investments

Tax holidays have proven effectiveness when offered to the business community to encourage industrial expansion into the newly developed satellite cities like the 10th of Ramadan and the 6th of October cities. They can be applied as transitional tools to encourage energy efficiency implementation for a horizon of 5-7 years.

Tax Incentives for Local Manufacturing of EE Products

The discussion above applies to this element as means to attract private investments in local manufacturing of energy efficiency products. However, one manufacturer has already started a production line of locally assembled electronic ballasts absent any specific tax benefits. Tax incentives can expedite the technology transfer to the local manufacturing community resulting in reduced costs and ability to export to neighboring countries.

Reduction in Custom Duties on Imported EE Equipment

This issue has been a subject of debate for a while simply due to the difficulty of determining what constitutes an energy efficiency device or equipment especially

in absence of equipment minimum efficiency standards. For example, past studies identified various level of custom duties assessed for the same equipment under 3 different customer applications. A detailed listing of energy efficiency measures should be compiled with projections of their market penetration for the near future. This can then be presented to the Ministry of Finance to assist in evaluating the Government revenue impact of such listing is to receive favorable custom duties treatment. This issue needs both short and long term design.

2.1.2. Encouraging Private Sector Delivery of Energy Efficiency

Allowing On-Site Generation (Cogeneration) and connectivity to the Country's Unified Power Supply (UPS) Grid

Until recently, the Ministry of Electricity and Energy (MEE) had not been in support of wide application of cogeneration or onsite generation. There is less than a hand full of cogeneration application in Egypt with ability to have a two-way connection to the national grid. Concerns over safety of the UPS grid, and reliability of these individual generation facilities caused the MEE to postpone the institution of a policy for self generation.

As part of the UNDP funded pilot, which takes place 1999-2003, the MEE is now evaluating a long term policy to rely on cogeneration facilities in meeting future demands. A detailed policy including tariffs for fuels and electricity back-up charges should be drafted for short and long term implementation.

Procuring Bundled Energy Efficiency and Generation Blocks

Although unlikely to be practiced in the near future, bundled blocks of demand and supply side resources procured competitively from power producers and ESCOs can create a demand on energy efficiency. ApproximatelyMW of electric generation are planned to be procured by 2017 under the Build Own Operate and Transfer (BOOT) model from private power producers. If a moderate percentage of this planned power is to be required from demand side sources, private power producers will create demands on the market to use efficiency as an alternate resource to new generation.

Facilitating Low Cost Long Term Financing Vehicles

Although investment capital is available in most financial institutions, compatible financing vehicles are not widely known to funding institutions. The current limited application of energy efficiency has not yet convinced private investors and financial institutions of the economic attractiveness of this industry. Proof of concept transactions and special loans have to be present to demonstrate the concept of ESCOs and private sector involvement in delivering energy efficiency services on a risk sharing basis. Government guarantees or facilitation of a reduced interest long term loans can provide an enabling environment for the different delivery channels to increase energy efficiency implementation.

2.1.3. Minimum Energy Efficiency Standards

- Minimum Efficiency Standards for Energy Using Equipment*
- Energy Efficiency Codes for New Construction Projects*
- Appliance Labeling*
- Developing Industry-Specific Energy Intensity Standards*

The above initiatives require time to develop, and therefore, should be introduced to the market gradually. Previous experience with Power Factor standards was successful from a market response perspective. Raising the Power Factor minimum level to 0.90 with a penalty imposed on the bill, pushed many end users to seek solutions to avoid such penalty. Similar approach should be implemented with cost effective technologies that are locally available. The climate is suited for the introduction of codes and standards. Both the UNDP/GEF project and the efforts of the Energy Efficiency Council have related elements therein.

2.1.4. Linking Energy Efficiency to Environmental Policy

When the Government of Egypt added to its priority list the need to improve the environmental quality in the Country and further demonstrated its commitment to the subject through Law 4 of 1994, the market responded. The Government priority was mirrored in the business community, and the financial industry paid attention to this emerging needs. Energy efficiency will take the same level of attention if it is promoted as an economic and environmental solutions. Law 4 can be amended to account for the benefits of energy efficiency and allow for credits toward environmental compliance.

2.2. Market Transformation Initiatives

Initiatives aimed at transforming the market to a more desirable and active mode are usually launched on experimental bases as test beds to test approaches and solutions that enable the market to change phases over time. Market transformation initiatives can be offered through existing or new delivery channels including local utilities, financial institutions, international donors, and other non-government organizations or industry associations. These initiatives are categorized in 3 main areas:

2.2.1. Awareness & Outreach Initiatives

Offered to increase public awareness of the economic and environmental benefits of energy efficiency to a variety of target audience including energy end users (public or private customers), Government agencies, and energy-related service providers. Other long term outreach activities include educational programs at the school and college levels. Past awareness initiatives proved that outreach programs are well received and do produce results. The USAID-funded ECEP initiative provided several awareness and outreach activities which helped increasing technical and business knowledge. However the effectiveness of these

initiatives can be easily diluted when the Government commitment is not clearly communicated through an enabling environment.

Outreach initiatives should focus on:

- Awareness and promotional campaigns to encourage private sector participation in delivering energy efficiency products and services
- Customer education and marketing campaign
- Promotion and educational initiatives to the financial industry
- Energy educational curricula in schools and colleges

2.2.2. Capacity Building Initiatives

Increasing the capacity of market delivery channels is critical to the growth of this industry and its sustainability. The following initiatives should be tackled over a long period to insure the continued growth of the market:

- Supporting the development of the private sector
- Training of human resources
- Technology transfer
- Support local industry associations
- Energy education
- Development of legal supporting tools
- Qualification and certification of professionals and service providers
- Stimulating energy efficiency trade opportunities

2.2.3. Funding and Investment Initiatives

Marketing initiatives targeting the financial community often focus on the cost of financing and the guarantee needed for the lender to consider funding unfamiliar energy efficiency transactions. The current financing culture in Egypt is going through transformation from short term asset-based financing to longer term and more project-oriented financing. However, the size of the available energy efficiency projects, and the cost of the transaction including the verification part create a disincentive to commercial banks and fund managers.

Financing energy efficiency is new to the Egyptian financial community and requires a major education on the technical and risk elements as well as the market potential. A few ideas were born recently to take advantage of the new leasing laws (passed Nov 1995) and the privatization of Government enterprises.

Following up on past investigative efforts on the financing issue should take into account:

- Introducing pilot financing vehicles and funds (equity or leasing)
- Encouraging ESCO's performance-based approaches
- Create a dialogue between ESCOs and financing professionals
- Promote requirements for energy efficiency in solicitations for new commercial projects to involve financing early on

3. THE ROLE OF MARKET PLAYERS & STAKEHOLDERS

The efforts of market players and stakeholders can be effectively organized in an integrated framework to increase demand on energy efficiency. The varying roles of stakeholders can be complementing to one another leading to faster adoption of efficiency. A comprehensive approach integrating the role of the Government, local utilities, ESCOs, manufacturers, service suppliers, the investment community, and international donors can be designed to push, enable, and pull the market towards the desired efficiency level.

Government -- Pushing the Market

Setting policy and developing strategy for long term market transformation using economic incentives, risk reduction, laws and regulations, and linking energy efficiency to the Country's environmental policy and GHG Reduction goals. Government intervention should be focused on:

- Tax incentives for energy savings
- Tax incentives for local manufacturing of EE products
- Favorable Custom Duties
- Cogeneration policy
- Private sector integrated energy efficiency and generation procurement
- Minimum efficiency standards
- Energy efficiency code for new buildings
- Equipment and appliance labeling
- Linking energy efficiency to environmental benefits

Local Power Companies -- Enabling Market Conditioning

Creating enabling tools to condition the market to move towards efficiency through economic signals and outreach such as:

- Implementation of a national DSM program
- Inclusion of energy efficiency in the Integrated Resource Planning
- Supporting tariff structures
- Creation of an energy efficiency center for training, public awareness, and outreach
- National media campaign

Donor Community -- Enabling Market Conditioning

Support efforts aimed at increasing market development and technological advancement including:

- Technology transfer
- Capacity building of delivery channels
- Technical and marketing assistance
- Information management
- Trade opportunities