

EGYPT: IMPROVE ENERGY EFFICIENCY

Final Report

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Abbreviations and Acronyms

AFD	Agence Française de Développement
AfDB	African Development Bank
CDM	Clean Development Mechanism
CFL	Compact Fluorescent Lamp
DANIDA	Danish International Development Agency
DEDE	Department of Alternative Energy Development and Efficiency
DSM	Demand-side Management
ECEP	Energy Conservation and Environmental Protection Project
EE	Energy Efficiency
EEAA	Egyptian Environmental Affairs Agency
EEBPP	Energy Efficiency Best Practice Programme
EEHC	Egyptian Electricity Holding Company
EEIGGR	Energy Efficiency Improvement and Greenhouse Gas Reduction
EEPP	Egyptian Environmental Policy Program
EgyptERA	The Egyptian Electric Utility and Consumer Protection Regulatory
EIA	Energy Information Administration
EIB	European Investment Bank
EPC	Energy Performance Contracting
ESCO	Energy Service Company
ESLGM	Egyptian Sustainable Loan Guarantee Mechanism
FEMP	Federal Energy Management Program
FI	Financial Institution
GEF	Global Environment Facility
GOE	Government Of Egypt
HBRC	Housing and Building Research Centre
IEA	International Energy Agency
IFC	International Financial Corporation
IMC	Industrial Modernization Center
JCEE	Egyptian-German Joint Committee on Renewable Energy, Energy Efficiency and Environmental Protection
JICA	Japan International Cooperation Agency
KEMCO	Korea Energy Management Corporation
MED-EMIP	Euro-Mediterranean Energy Market Integration Project
MED-ENEC	Mediterranean Energy Efficiency in the Construction Sector
MOEE	Ministry of Electricity and Energy
MOH	Ministry of Housing
MOP	Ministry of Petroleum
MSEA	Ministry of State for the Environmental Affairs
MTI	Ministry of Trade and Industry
NGO	Non-Governmental Organizations
NREA	New and Renewable Energy Authority
OEP	Organization of Energy Planning
PSDP	Private Sector Development Program
RCREEE	Regional Center for Renewable Energy and Energy Efficiency
SCE	Supreme Council of Energy
SME	Small- and Medium-sized Enterprise
SPAP	Second Pollution Abatement Project
TA	Technical Assistance

Executive Summary

Over the past decade, the primary energy supply of Egypt has increased significantly, with a growth of about 56%. Final energy consumption expanded at a slightly higher pace from 1998 to 2008 with a total boost of 72%. As in most developing countries, the fast rise in primary commercial energy demand has been driven by three factors: (i) increasing household use of modern energy, especially electricity; (ii) increasing industrialization; and (iii) the expansion of motorized transport. Egypt's industrialization and urbanization process is still evolving. With a per capita Gross Domestic Product (GDP) at about US\$ 1800 in 2007, Egypt is a lower middle income country. Egypt's energy consumption per capita remains very low at 0.89 tons of oil equivalent (toe) (IEA, 2007)¹, compared with the world average of 1.82 toe and the OECD country average of 5.1 toe (IEA). It is expected that the energy consumption will continue to grow in tandem with the economic growth and improvement of people's living standards. The three factors will continue to drive the energy demand increase for several decades to come. Simply based on the trend from the past decade, the Government of Egypt (GOE) projected that final energy consumption would more than double in the next 12 years.

From 1998 to 2008, a growth of 6% per year in energy consumption was achieved with a net reliance on Egypt's own energy resources at relatively low costs. The domestic oil production has been declining since mid-1990s and natural gas production could still be expanded, but at increasingly higher development costs. Therefore, meeting the pressure of another strong energy demand during the next decade or so will be a much more difficult and costly challenge than in the past.

Egypt has an overall low efficiency in using energy resources to create economic wealth as demonstrated by its high energy intensity. Egypt is among the most energy intensive economies in the MENA region as well as in the world. The Egyptian energy intensity is almost twice as high as in some neighboring countries like Morocco and Tunisia and four times as high as industrialized countries like Japan and Germany. On sectoral level, most industrial processes, equipment and consumer appliances in Egypt have 20% or more higher energy consumption than the best international practices. Therefore, Egypt has a great potential to improve the efficiency of its energy resource utilization across all segments of economic activities.

The recent energy supply uncertainties, combined with increasing energy costs, have led the country to look into Energy Efficiency (EE) alternatives. However, despite this general interest in EE by the GOE and the statement of an ambitious target to reduce energy consumption by over 8% in 2022 as compared to the projection under business-as-usual scenario, it appears that there has been little progress in developing an adapted policy framework and institutional structure to support the achievement of the stated target.

The objective of this report is to take stock of the past/ongoing energy efficiency initiatives and activities and to recommend a set of the principal strategic actions which could be undertaken by the GOE to promote and sustain EE improvements. The first part of the report

¹ IEA Official website, www.iea.org.

presents the following topics: (i) a brief general overview of energy use in Egypt; (ii) an analysis of the current institutional framework for EE; (iii) a review of the main past, ongoing and future EE activities and programs implemented by different organizations; and (iv) an identification of the major barriers to EE. In the second part of the report, specific recommendations to further improve EE in Egypt are presented, supported by a review of some of the relevant international best practices and lessons learned from national and international experiences.

Tapping Energy Efficiency

The industrialized and many developing countries have made efforts to foster efficient energy use and have seen energy intensity declining for the past 30 years. Egypt, whose economy is one of the most energy intensive, has experienced only small improvements in the recent past. This is driven by both the macro- economic policy and energy policy.

The structure of Egypt's economy has been moving toward further industrialization over the last decade. The share of industry in the total GDP has increased from 24% to 32% while the share of both the service and agriculture sectors has decreased by about 4%. As the industry sector is much more energy intensive than the service and agriculture sectors, such a shift would have increased the energy intensity of the economy if other factors had remain unchanged.

The GOE has largely been orienting its approach to meet this growing demand largely through the supply increase, with much less focus on EE and demand-side potentials. It is generally established that improving EE is the lowest-cost option to meet energy demand. EE represents a cost-effective technical and financial alternative to moderate the energy demand growth and thus stabilize energy balance. It also generates several other benefits such as (i) reducing energy infrastructure investment needs, (ii) enhancing energy supply security, (iii) helping mitigate local air pollution which is becoming serious in Egypt, (iv) contributing to reducing the growth of carbon dioxide emissions globally; (v) spurring new economic activities, and (vi) creating new job opportunities. EE could also help the GOE to reduce its huge energy subsidy which is running towards unsustainable level.

Egypt's energy saving potential is very difficult to quantify, partly due to the limited availability of data on energy consumption by subsectors and industrial processes. However, the energy audits and energy consumption surveys carried out over the past clearly show that there are significant potentials for EE improvements across all segments of the Egyptian economy. Based on a recent energy study conducted by the GOE, the broad economic sectors of Egypt can reduce energy consumption by 5% to 20% without compromising output. In fact, this figure was used to set the national target for energy consumption reduction at 20% by 2022 relative to the energy consumption in 2007.

According to different estimates and studies conducted by the GOE or international organizations, the EE potential in the important energy-consuming sectors of Egypt has been evaluated as follows:

- In the industrial sector, most industries have 10% to 40% of energy saving potential.

- Building and appliance EE can be improved by up to 20% to 80% through better insulation and better standards.
- The estimated energy saving potential in the water sector amounts to more than 20%.
- The transport sector represents an energy saving potential of about 15% even relying on existing transportation modes and technologies.

EE Initiatives

Various initiatives have been taken since the late 1980s in relation with EE improvement. However, the overall impact of these initiatives appears to be limited. Failures to achieve certain sustainable results in key areas have been noticed:

- Despite the efforts supported both by USAID and by UNDP/GEF EEIGGR projects to develop the Energy Service Company (ESCO) business, the few existing ESCOs are undercapitalized and have difficulties accessing financing.
- Energy audits were carried out but only a few projects were implemented afterwards.
- The implementation of demonstration projects proved the technical feasibility and cost-effectiveness of EE investments. However, information dissemination was not sufficient and there has been no large-scale replication of these projects. Most demonstration projects were entirely financed by grants under these programs and failed to stimulate investment activities by the business and industries.
- The Egypt Electricity Holding Company (EEHC) launched a major program of promoting the use of CFLs to replace incandescent lamps. The effectiveness and sustainability of the program can be improved by better monitoring and evaluating efforts.
- The Organization of Energy Planning (OEP) once had the mission to promote EE through data collection and analysis, energy auditing, awareness program and demonstration project. But OEP ceased function in 2005.
- EE standards for four domestic appliances and EE building codes for new facilities were developed under the UNDP/EEIGGR project but compliance with those standards and codes are still voluntary. There is neither capacity nor procedures in place to ensure mandatory compliance with the regulations implemented.
- Many of the initiatives and activities focused on market-based programs to promote EE investment by industry entities while the prevailing low energy prices did not justify such investment.
- Although some attempts were made, the initiatives have not resulted in the creation and implementation of a clear regulatory and institutional framework which could support and sustain EE activities and programs.

Barriers to EE

The potential for energy savings across the Egyptian economy is huge and remains largely untapped, essentially because of a series of barriers impeding EE improvements:

- Lack of effective actions by the Government to address EE
- Weak legal, regulatory and institutional framework to promote EE
- Absence of policies, incentives and financial measures

- Lack of dedicated funding to promote and support EE activities
- Underutilization of utilities to promote and implement EE initiatives
- Unavailability of adapted financing for EE projects
- Lack of intermediaries and technical capacity
- Weak information dissemination and awareness campaign.

The weaknesses in the institutional, regulatory and policy environment for EE in Egypt are illustrated by the following aspects:

- Energy prices are well below costs and do not encourage energy savings.
- There is no law, regulation or effective policy to promote EE.
- Development of dedicated institutions in charge of developing EE strategies, implement EE programs and monitor progress is in very early stages.
- There is a dearth of reliable data and information on energy use by subsectors, key industries, equipment and appliances.
- There are no mandatory fuel efficiency standards in transport, no mandatory EE building codes, no benchmarking for industries, and only few EE standards for appliances.
- There are no EE funds or other financial mechanisms and incentives to support EE activities.

These barriers can be identified as key elements that should be addressed by the GOE in order to enable EE development. As many other countries did after facing the same common barriers, Egypt needs to develop and implement a set of administrative and regulatory measures along with a variety of market-based programs to spur EE investments and induce behavior change.

Towards Sustainable Energy Efficiency Improvement

All countries which have had success in promoting EE use a mix of government regulations combined with policies and programs that encourage energy efficiency investment and behavior change through the market. Based on well documented international experience and the analysis of the Egyptian EE framework, it is recommended that the GOE take a set of actions and introduce different measures to address the current identified barriers related to the EE situation in the country:

- **Develop a comprehensive and reliable energy data and information system.** Currently, the relevant ministries have detailed data and information on the total amount of energy products which have been produced, transmitted and delivered. However, there are no reliable energy data and information about final energy consumption by different sectors and different industries. Without such data, it is difficult to assess EE improvement potentials in the various segments of the economy.
- **Continue the ongoing energy price reform.** A cost-reflective energy price level and structure is a key driver for EE market development and sustainability. Such prices induce consumers not to consume beyond what is economically justified. Cost-reflective prices also make it economic to invest in EE projects, making such projects a lot more attractive to end-users and investors. The ongoing energy price reform to

rationalize both the level and structure of energy prices should be pursued further until the energy prices fully reflect the costs of supply for different energy usages and the consumers actually see the price signal. The welfare of poor households could be protected from energy price increase through: (i) a well-designed and implemented social protection program funded by the government budget; or (ii) a well-targeted energy pricing structure, such as rising block-tariffs for residential users, that would subsidize less energy-consuming households through higher prices on high energy consumption.

- **Improve institutional framework by creating clearly defined institutional structure to coordinate and promote all EE activities at national level.** International practice is to provide a dedicated EE agency with a clear mandate and an appropriate budget to develop EE strategies, propose targets, programs and policies, and coordinate their implementation, progress and impact. In many countries, the establishment of a dedicated institutional EE entity, with clear mandates, sufficient staff and budget, has been the first step in achieving widespread scaling-up of EE activities and programs. Such a dedicated institution can be designed in various ways with respect to the scope of its responsibilities and its size and complemented by sector-specific energy efficiency institutions.
- **Improve the legal, regulatory and policy framework.** The presence of a well developed legal and regulatory framework is a cornerstone to achieving substantial progress in EE over long term. The enactment of an EE law will be important to lay the foundations to institute and enforce regulations (building codes, equipment standards, etc.), provide legitimacy to organizations and their work, implement specific tariff measures and incentive policies, and assign responsibilities and funding.
- **Improve awareness level.** Access to information is a fundamental component to develop a sustainable EE environment. Sporadic efforts have been made in the past along these lines, but have not been sustained. The EE project implemented by USAID in the 1980s and 1990s produced a wealth of excellent technical guidance notes, which seem to no longer be widely available. This may be a consequence of the rather fluid nature of the institutional responsibilities for EE in Egypt.
- **Address market failures by supporting the development of demonstration projects and capacity of intermediaries.** There is no a sustainable private sector-based EE market in Egypt at this time. Building the necessary capacity at the intermediary financing institution and end-user levels is important for creating a sustainable market. This effort should include be accompanied by well-selected demonstration projects to improve awareness and disseminate information.
- **Use utilities as executing agencies.** Utilities can play an important role in the development of an EE market in a country. Some utilities have been promoting EE activities in Egypt but much more could be done by them to actively promote and implement EE. It has been demonstrated in many countries that utilities can be used as very efficient executing agencies to implement EE programs. Because the introduction of such a mechanism can become costly to the utilities, both in terms of management and in lost revenues, it has been a common practice for governments to foster such initiatives through grants or other financing mechanisms.

- **Support the introduction of a tailored EE financing mechanism.** One of the major barriers to the implementation of EE projects is the absence of tailored financing mechanisms to enable interested private parties to implement financially viable projects. The Egyptian Sustainable Loan Guarantee Mechanism (ESLGM), developed three years ago under the UNDP/GEF EEIGGR project, demonstrated that such mechanisms could trigger an important leverage effect in the market, even though the mechanism was limited by its very small size.
- **Set priorities in the sectors/technologies to be addressed first.** As the current global EE potential is huge across all sectors in Egypt and features many barriers, the GOE will have to prioritize the initiatives it plans to launch in the market. A simple analysis of the Egypt energy profile clearly shows that the industrial sector is by far the most energy-consuming sector, followed by residential and transport sector. Therefore, it seems natural to give a particular attention to EE in the industrial, residential, and transport sectors. Energy efficiency improvement in the residential and transport sectors could mostly be achieved through implementation of standards and codes to be developed and tightened gradually. It will take time to yield measurable results in these sectors. On the other hand, implementation of measures in the industrial sector could produce quick results and should be the highest priority sector for the government. Focusing on specific technologies rather than specific sectors has also been done in different countries with positive effects as they often have a broader potential scope and may be easier to manage.

Immediate Actions to be taken

The development and implementation of institutional, regulatory and policy frameworks to achieve sustainable EE requires good planning and takes time. The following is a set actions that are recommended for immediate implementation:

- Issue a strong policy statement to clarify the GOE's intention on and commitment to EE to send a clear signal to society and the public;
- Initiate the process of developing an institutional framework adapted to the local context to promote and implement EE;
- Designate and empower an existing institution to take stock of the past and ongoing EE activities and coordinate existing and future programs. The agency should be provided with adequate staff (including use of consultants) and budget to carry out its duties;
- Based on the review, develop short-term and medium-term activities and programs for implementation;
- Clarify responsibilities for energy consumption data collection and analysis and develop a reliable energy consumption database;
- Allocate funding sources to support planned EE activities and programs;
- Prioritize activities by sector or business line with significant opportunities;
- Focus initially on tapping high-return activities in the industrial and public sectors; and
- Develop commercial financing for EE improvements.

Proposed EE Activities for Donor Support

The GOE should seek and coordinate the use of potential EE funding from donors to support the development of institutional, regulatory and policy framework and the implementation of energy efficiency investment programs. The proposed EE activities to be carried out in the near to medium term which could be potentially supported by the donors are shown in Table 3.2. As the activities embody potentially wide scope of work, they could be supported by more than one donor that have interest in promoting EE activities and investment in Egypt.

Table 3.2: Proposed EE Activities for Donor Support

Activity	Description	Possible Source of Funding
Follow-up ESMAP TA	This activity will be a continuation of this study, aiming to assist the GOE in: (i) elaborating the institutional options and proposing an institutional and regulatory framework adapted to the local context of Egypt to promote and implement EE; (ii) proposing a set of policies, financial incentives and funding options and mechanisms aligned to the economic context of Egypt to encourage and support EE activities and investment; (iii) develop a priority EE investment program for implementation by public and private sectors through assessing the energy saving potential and conducting cost-benefit analysis of EE projects in selected priority areas.	ESMAP
A GEF Operation	The objective of the GEF operation is to create the enabling institutional, regulatory, policy and financing environment to support and sustain energy efficiency activities and investment. The operation could include the following components: (i) establishment of a reliable energy consumption and efficiency data system; (ii) development of EE indicators for key sectors, processes and appliances; (iii) development of monitoring and devaluation framework for EE programs and activities; (iv) capacity building for government, suppliers, consumers and EE service providers; (v) creation of stable funding mechanisms to support EE; and (iv) implementation of demonstration projects	GEF
EE Investment Project	The objective of the project would be to help improve EE in selected priority areas with the best potential for scale up. The project could include: (i) a TA component to strengthen the institutional capacity to develop and sustain EE lending business, enhance the technical capacity of local financing institutions, and support the	Multilateral and bilateral development agencies, commercial banks

	establishment of energy service companies (ESCO); and (ii) an investment component to directly support the preparation and implementation of technical and financially viable EE investment priority projects.	
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CHAPTER 1: ENERGY SECTOR PROFILE

Growing Energy Demand

Egypt's primary energy consumption increased from 58.7 million tons of oil equivalent (mtoe) in 1998 to 91.7 mtoe in 2008, a rise of 56% with an annual rate of 4.67%. The type of primary energy consumed also changed significantly. The total amount of oil consumed decreased by 20% from 1998 to 2008 while the total amount of natural gas consumed increased by more than 3 times during the same period. The amount of hydro remained largely constant over the 1998-2008 period. In percentage terms, oil dominated the energy mix in 1998, accounting for an overwhelming 73%, natural gas and hydropower accounted for 21% and 6% respectively. Natural gas is now dominating the energy mix, accounting for 58% in 2008, while oil and hydro power have decreased to 38% and 4% respectively.

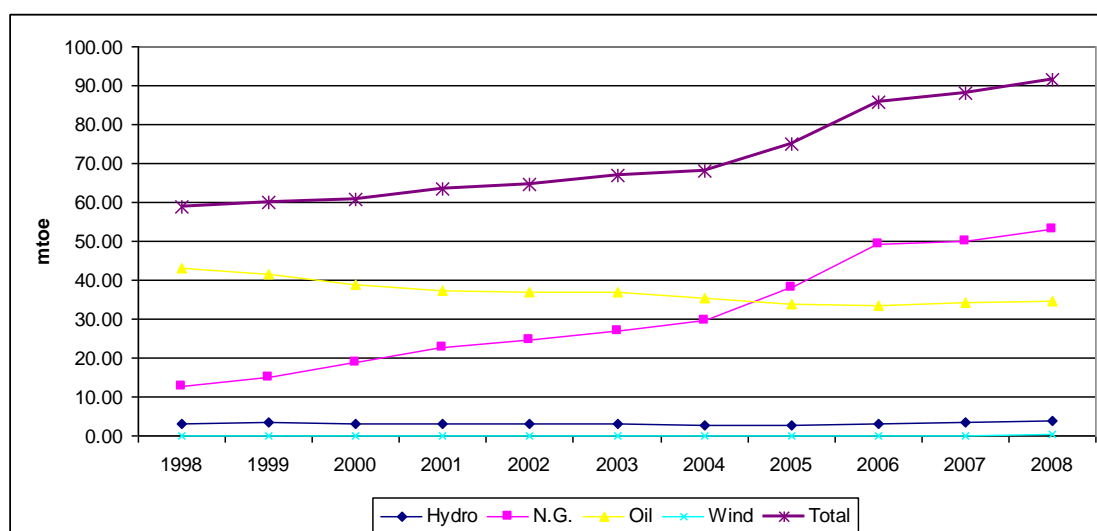


Figure 1: Primary Energy Consumption (1998 – 2008)

The evolution of the final energy consumption between 1998 and 2008 is illustrated in Figure 2. A new classification was introduced in 2005 for petroleum products and natural gas and this has affected the shares of total energy consumption of the common sectors. The final energy consumption increased at a slightly higher pace from 1998 to 2008 with a total increase of 72%, considering the new classification. The type of final energy consumed also changed during the period. The share of gas and electricity in the energy mix increased from 12% and 33% respectively to 18% and 39%, while the share of oil decreased from 55% to 43%. The faster increase in final energy consumption than in primary energy consumption indicates better conversion efficiency as natural gas substituted oil for power generation.

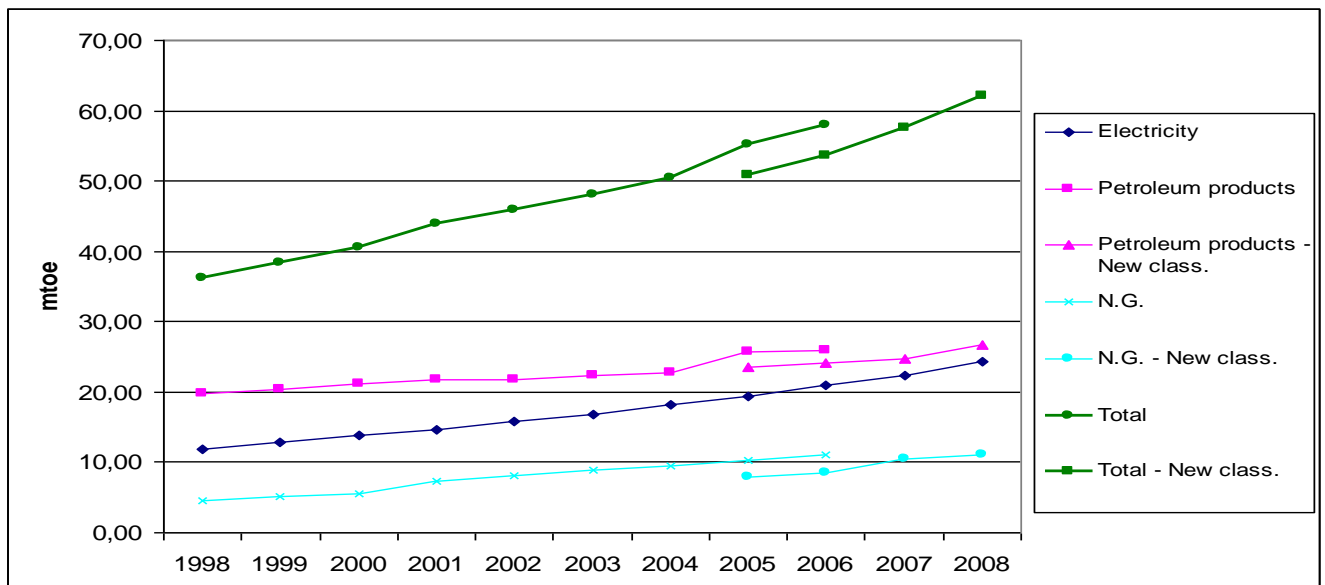


Figure 2: The Final energy Consumption by Category (1998 – 2008)

Among the various energy consumption sectors, the industrial sector accounted for about 45% of total final energy consumption in 1998, followed by the transport sector (24%), the residential and commercial sector (29%), and the agricultural sector (2%). This distribution pattern has largely stayed the same during the last decade. By 2008, industry’s and agriculture’s shares stood at roughly the same 45% and 1.7%, while commercial and residential sector share edged up to 32.3% and transport’s share decreased slightly to 21%, indicating slightly faster energy demand growth in the commercial and residential sector (Figure 3).

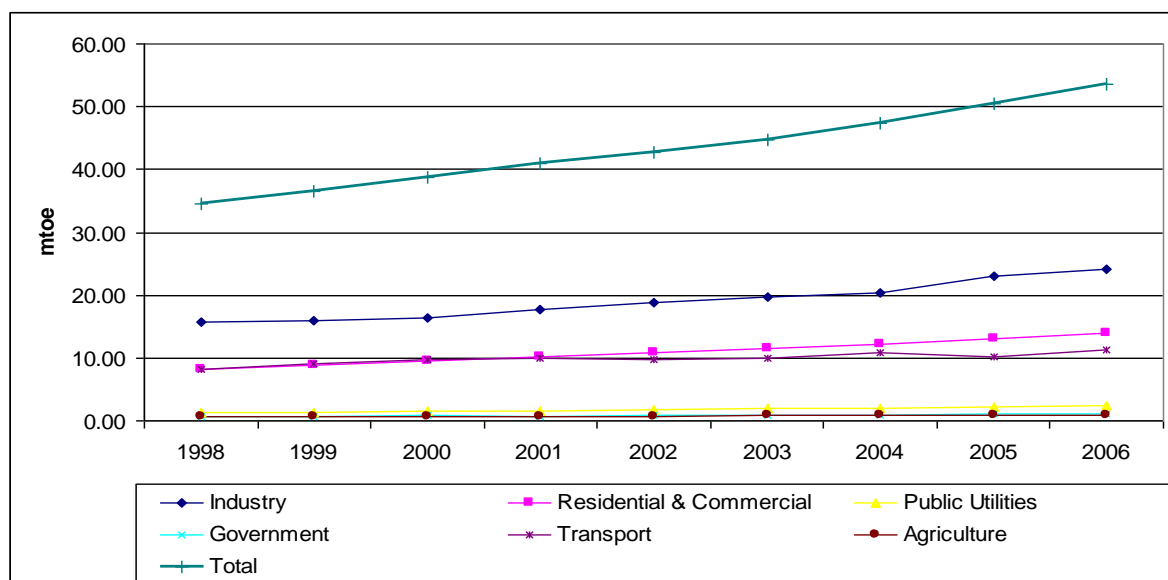


Figure 3: Final Energy Consumption by Sector (1998-2006)

On the electricity side, the use in the building sector has grown particularly fast with annual growth rates of about 7%, triggered by an increase in urban populations, and growing incomes and comfort demands. In 2002, final energy consumption of the residential and commercial sectors amounted to 10% of the total; including public buildings they accounted for about 44% of total electricity consumption. In 2007/08, the residential sector had

overtaken the industrial sector in terms of electricity consumption, and more than half of all electricity was consumed in the buildings sector. Actual data on electricity consumption patterns are very limited. Surveys indicate that lighting and cooling are the most important end-uses of electricity. In the residential sector, lighting, fridges, TV and other entertainment account for about two thirds of consumption; in the commercial and public sector, air conditioning and lighting account for over two thirds and about half of electricity consumption, respectively² The increasing use of electricity for cooling adds substantially to the peak load during summer, requiring the installation of new power capacity.

Primary Energy Supply

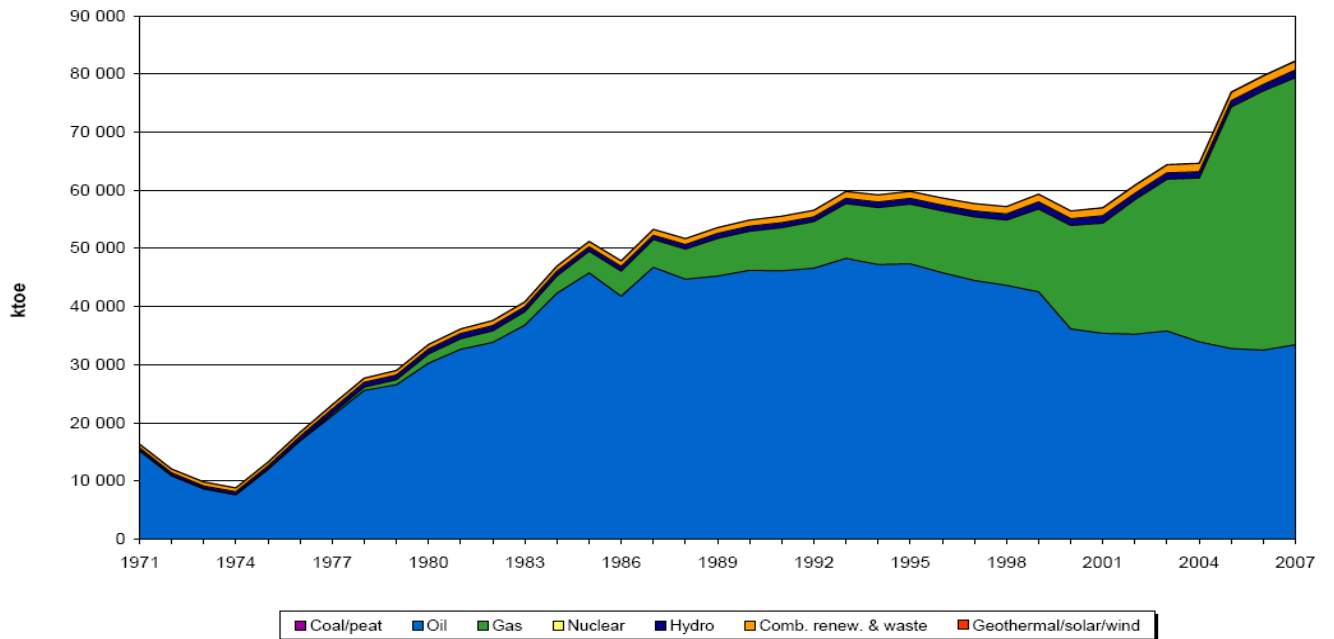
The Egyptian energy sector depends on various resources for the primary energy supply. The dominant sources of primary energy production are oil and natural gas. Even though Egypt has been a significant oil producer and exporter, oil production has been declining steadily since it peaked in the mid-1990s. In 2007, total oil production was about 710,000 bbl/d, a decline of 50% from its peak in the mid-1990s.

Since Egypt started to produce natural gas in the early 1980s, gas production has been rising steadily and the entire production was absorbed by the domestic market for the next 20 years. Since 2000, the production rate has increased sharply, with an average annual rate of 14%. As of today, production continues to rise sufficiently to respond to increasing demand, but has also made Egypt an important net exporter of natural gas and the 13th largest producer in the world (2007).

Hydro power supplied most of Egypt's electricity needs for many years, but, as most of Egypt's hydro power potential has been explored, electricity production from hydro has stood still. With the increase in overall energy production, hydro's share has been declining steadily.

In 2000, Egypt started to develop its huge wind potential, but the progress has been slow. As of 2008, wind electricity production represented less than 1% of total electricity production and 0.23% of total primary energy production. The evolution of primary energy production in Egypt is illustrated in Figure 4.

² [http://www.med-enec.com/en/TOPIC/Market Studies/Market Study and Capacity Assessment - Egypt.pdf](http://www.med-enec.com/en/TOPIC/Market%20Studies/Market%20Study%20and%20Capacity%20Assessment%20-%20Egypt.pdf)



Source: OECD/IEA 2009

Figure 4: Energy Production Evolution in Egypt

Energy Trade and Balance

Egypt was once an important oil exporter but with declining production and increasing domestic consumption, the country has been moving away from being a net exporter of oil over the past few years. In 2007, the production of oil was sufficient to prevent the country from becoming a net importer of oil as some had predicted (Figure 5). Although Egypt continues to be a small net exporter of oil in physical terms, its balance of trade in oil has been negative for some time as Egypt exports low-value products (crude and heavy oil) and imports high-value products (diesel and LPG).

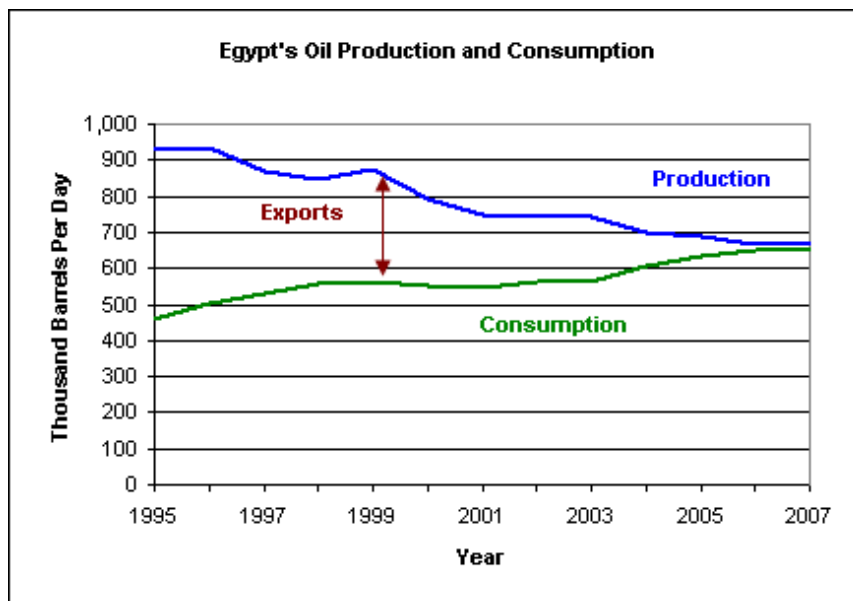


Figure 5: Egypt's Oil Production and Consumption

In 2003, Egypt started to export gas with the completion of a pipeline to Aqada, Jordan. With the opening of the country's first liquefied natural gas export terminal in January 2005, gas exports became significant. In 2007, exports reached 15 billion cubic meters (bcm), representing one-third of Egypt's production (Figure 6).

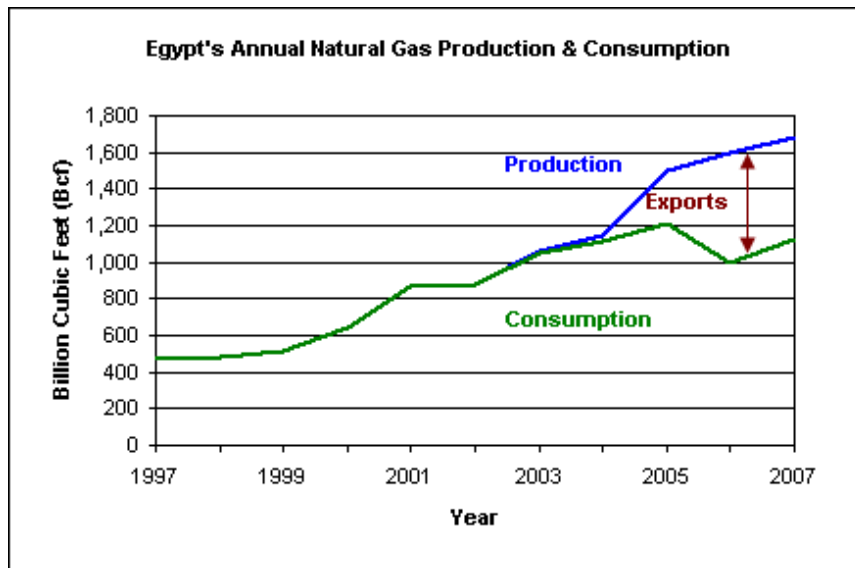


Figure 6: Egypt's Oil and natural Gas Production vs. Consumption Evolution

Although Egypt is a net exporter of energy in physical terms because of its natural gas export, it is actually a big energy importer in monetary terms. Egypt has to purchase a significant part of the oil and gas for domestic consumption from Foreign Partners (Figure 7). This part of the oil and gas is physically produced in Egypt's oil and gas fields, but it is owned by foreign partners as specified under the Production Sharing Agreements. While Egypt may have the first right to purchase the foreign partner's portion of the oil, it has to pay prices which fully reflect prices in the international oil market. Although the price of gas is not generally directly linked to prices in the international energy market, it is a cost in Cash and foreign exchange to Egypt. So a large part of the oil and gas consumed in the local market is not really very low cost locally produced energy as perceived by many people, but energy paid for at international market prices.

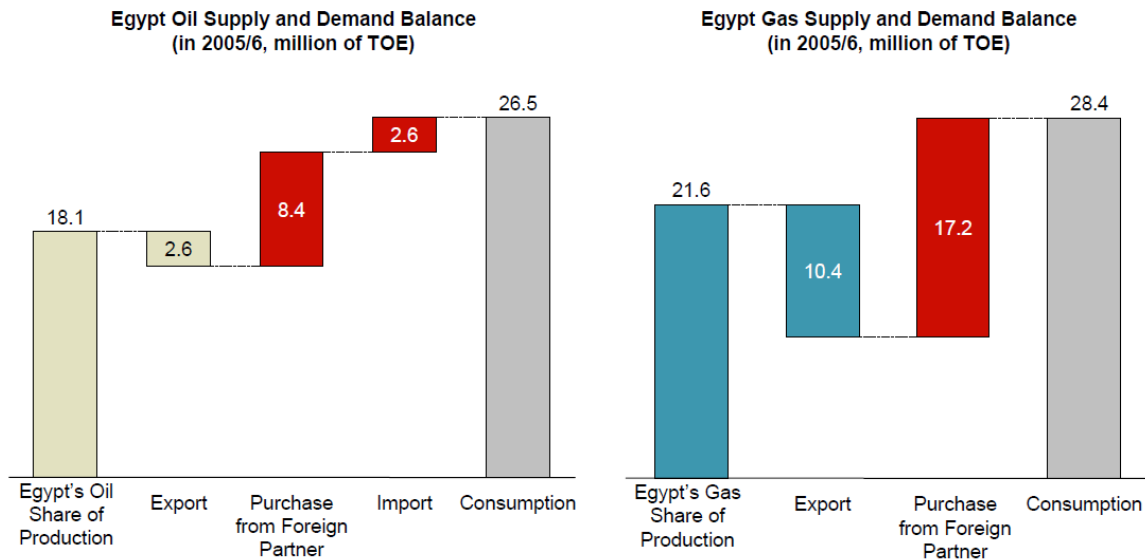


Figure 7: The Oil and Gas Supply and Demand Balance

Future Outlook

Despite the huge increase in total energy consumption, Egypt's energy consumption per capita remains very low at 0.89 toe (IEA, 2007)³, compared with the world average of 1.82 toe and an OECD country average of 5.1 toe (IEA). It is expected that energy consumption will continue to grow in tandem with the economic growth and improvement of people's living standards but the pace of such growth will depend on many factors, such as the growth rate of the economy, the changes in economic composition, the evolution in people's behavior, and policies related to energy development and consumption. Simply based on the trend in the past decade, the Government of Egypt (GOE) projected that final energy consumption will more than double in the next 12 years (Figure 8).

³ IEA Official website, www.iea.org

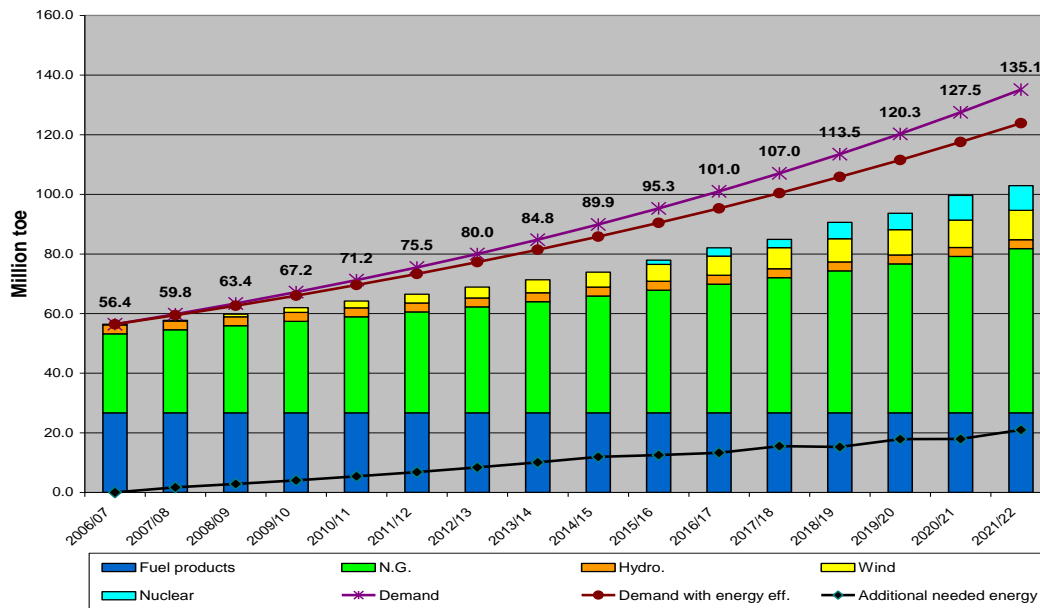


Figure 8: Projected Energy Consumption (2007-2012)

Growth in energy consumption of 6% per year from 1998 to 2008 was achieved with a net reliance on Egypt's own energy resources at relatively low costs. The Ministry of Petroleum (MOP) indicated that new reasonable oil discoveries are lacking and the increase in oil demand will have to be met through imports. The MOP also indicated that gas production could only be increased slightly under the existing framework to meet part of the growing needs. In physical term, energy demand is expected to exceed national energy supply potential by 2015, at the latest. There might be sufficient gas reserves to be developed to meet a large part of the growing energy consumption, but these would probably be at increasingly higher development costs. Other forms of energy like nuclear power, wind and solar could help meet part of the demand growth, but certainly with large increases in costs compared to the past. Therefore, meeting the pressure of strong energy demand during the next decade or so will be a much more difficult and costly challenge than in the past.

CHAPTER 2: POTENTIAL FOR ENERGY EFFICIENCY IMPROVEMENTS

High Energy Intensity

A country's potential for improving the efficiency of energy resource use is generally assessed on both the macroeconomic level and on the sectoral level. Energy intensity, a ratio of the amount of energy used per unit of economic output in dollars, is used to measure the overall efficiency of a country in using energy resources to create economic wealth. At the sectoral level, energy efficiency is used to measure how efficient an industrial process, piece of equipment or an appliance is in converting energy or using energy to produce a specific product or deliver a specific service.

The energy intensity of a country's economy depends on many factors, including the structure of the economy, the structure within the industry sector, the mix of the energy supply and the efficiency of energy conversion and consumption by industrial processes, equipment and consumer products (see Appendix I) among others. Table 1 shows the energy consumption per unit GDP value created in a number of selected countries with a large population at a similar development stage (with similar per capita GDP). On the macro level, Egypt is among the more energy-intensive economies in the group. If measured in PPP terms, Egypt is among the most energy intensive economies in the group. The energy intensity in Egypt is almost double that of some neighboring countries like Morocco and Tunisia, and four times as high as in countries like Japan and Germany.

Table 1: Energy Use per Unit GDP (toe/000 2000US\$)-2007⁴

Country	India	Indonesia	Philippines	Morocco	Tunisia	Thailand	Ukraine	China	Egypt
Nominal GDP	0.77	0.82	0.37	0.27	0.33	0.60	2.63	0.75	0.49*
Ratio	2.85	3.04	1.37	1.00	1.22	2.22	9.74	2.78	1.81
PPP	0.15	0.23	0.09	0.09	0.11	0.19	0.41	0.19	0.21*
Ratio	1.67	2.56	1.00	1.00	1.22	2.11	4.56	2.11	2.33

*The number is from the IEA report which quotes the total primary energy consumption as 67.25 mtoe in 2007. If the primary energy consumption is 87.93 mtoe as quoted in this paper, the energy use per unit GDP would be 0.64 in nominal term and 0.27 in PPP term.

From 1998 to 2008, Egypt's GDP increased by 60% at an average annual growth rate of 4.8%, while primary commercial energy consumption increased from 58.7 mtoe to 91.7 mtoe, an increase of 56% at an average annual rate of 4.56%. Primary energy consumption grew at almost the same rate as GDP, meaning the energy intensity of Egypt's economy remained unchanged. However, the final energy consumption during the same period increased from 34.57 mtoe to 62.07 mtoe, an increase of 80% at an average annual rate of 6%. The slower growth rate in primary energy consumption is primarily due to improvements in the energy conversion process following the introduction of much more efficient gas power

⁴ IEA, Key world energy statistics 2009

generation technologies (CCGT). Without the large scale substitution of gas for oil products in power generation, primary energy consumption would have increased at a faster rate than the growth rate of GDP, and the energy intensity of Egypt's economy would have increased. Most developing and developed countries experienced significant energy intensity reductions during the same period.

Economy towards Industrialization

The structure of Egypt's economy moved toward further industrialization during the last decade (Table 2). The share of industry in the total GDP increased by 8% from 24% to 32%, while the shares of the service sector and the agriculture sector decreased by about 4% each. Since the industrial sector is much more energy intensive than the service sector and the agriculture sector, such a shift would have increased the energy intensity of the economy if other factors remain unchanged.

Table 2: Evolution of the Economic Structure in Egypt

Share (%)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Service	58.8*	58.5	56.5	56.4	55.5	54.3	53.9	54.7	53.5	54.9	54.8
Industry	24.1	24.1	26.7	27.0	28.0	29.3	30.9	30.4	32.4	30.7	31.9
Agriculture	17.1	17.4	16.8	16.6	16.5	16.4	15.2	14.9	14.1	14.4	13.3

* The Service sector includes electricity, water and construction sub-sectors by Egyptian classification. If these are moved to the industry sub-sector, the share of the service sector will drop by about 7% and the share of the industrial sector will increase by about 7%. This will make the figures largely consistent with those in this table.

Although the growth rate of the industry sector during the last decade is higher than the growth rate of GDP, the growth rate of the most energy intensive industry sectors is slower. Of the 7 most energy intensive sub-sectors listed in Table 3, three sub-sectors grew almost at the same rate as GDP while the other four sub-sectors grew at nearly one-third of the GDP growth rate. This development should have helped reduce the energy intensity of the overall economy.

Table 3: Growth of the Key Energy Intensive Industries

Industry	Ceramics	Glass	Cement	Steel	Aluminum	Fertilizer	Paper	GDP
Increase in Production (2000-2008)	61%	63%	65%	22%	24%	27%	26%	62%

Egypt certainly has the potential to further expand the service sector and increase its share in the economy. At the very least, economic policies should be formulated and implemented to prevent the further shrinking of the service sector's share in the economy as in the last decade.

Energy Efficiency Potential by Sector

At the sectoral level, due to the limited availability of energy consumption by sub-sectors and industrial processes in Egypt, the energy savings potentials are very difficult to quantify. However, the energy audits and energy consumption surveys carried out over the past decade clearly show there is significant potential for energy efficiency improvements in all

segments of the Egyptian's economy, from production, transformation to end use by industrial processes, equipment, buildings, and appliances.

Based on a recent energy study entitled "Energy and Development – November 2007" by the government of Egypt, the broad economic sectors of Egypt can reduce energy consumption by 5-20% without compromising their outputs. But there is no detailed information on how these potentials are derived. Indeed, these potentials were used as targets for energy consumption reduction equal to 20%⁵ of the energy consumption in 2007 for producing the same economic outputs, which would be reached in 2022. This reduction represents 8.3% of the estimated total energy consumption in the year 2022 (Table 4). The selected energy audits and surveys carried out over the past few years demonstrate that the energy efficiency potential for the various sectors could be much greater.

Table 4: Potential Energy Savings at the End User Side (2022)

End user sector	Sector potential %age Savings	Equivalent National %age Savings
Agriculture & Irrigation	5	0.05
Gov. & Pub. Utilities	15	0.45
Res. & Comm.	15	3.00
Transportation	15	4.50
Industry	20	9.40
All sectors		17.4

Power Generation

Despite significant improvement in power generation efficiency in the last decade, through the switch from fuel oil to natural gas and the introduction of combined-cycle generation technologies, the power subsector still has significant scope for EE on the supply side. The modern combined cycle power plants fuelled by natural gas have a conversion efficiency of around 55%, while the best steam power plants have a conversion efficiency of about 40%. The capital costs for CCGT are also lower than steam generation technologies. In a power system, as far as possible, the percentage of the CCGT plants should be maximized within technical and fuel supply constraints. Currently, CCGT technologies account for about 45% of the gas-fired installed capacity, only about 30% of the total installed capacity in the system. CCGT can serve both as base capacity and intermediate capacity. In many countries, over 70% of the total capacity in a power system is served by the base load and

⁵ National Democratic Party paper on energy and development, October 2008

intermediate capacity. There is still room to further increase the share of CCGT in the power system. An increase in the share of CCGT from 30% in the system to 50% could increase the overall power generation efficiency by more than 3%.

Another way to increase supply side EE is to increase the development and optimize the operation of cogeneration power plants. Where there is a demand for steam, a cogeneration plant to meet the steam demand and supply electricity to the grid would easily increase the overall supply efficiency by 15-20%. A study by USAID in 1998 indicated that cogeneration could offer the second highest potential for energy saving, with potential fuel saving equivalent to about 3.6% of the total final energy consumption in Egypt at that time.

Heat Production

There is great potential in reducing energy waste in the process of heat production, transmission and distribution. Energy waste can be reduced by simple measures like improved insulation of tanks, improved insulation of water and steam pipes, improvement of condensate use as feed-water as well as the recovery and use of exhaust heat. The KfW study concluded that these measures can reduce energy waste by as much as 100% with rapid payback periods (Table 5).

Table 5: Measures to Improve Energy Efficiency in Heat Production

Technology	Energy efficiency measure	Complexity	Investment	Energy savings*	Payback period**
Combustion	Implementation of combustion air control by measuring oxygen content in exhaust gas	medium	medium	up to 2%	1-7 Years
	Implementation of boiler power output control (use of modern burners)	medium	medium	0.5-2%	5-10 Years
Steam generator	Insulation of steam generator	simple	low - medium	up to 5%	3-7 Years
	Return and utilization of condensate	simple	low - medium	5-10%	1-7 Years
Heat recovery	Air preheating or feed water preheating (economizer)	simple	medium		3-10 Years
Distribution	Insulation of pipes and heated	simple	low	up to 10%	1-3 Years

Technology	Energy efficiency measure	Complexity	Investment	Energy savings*	Payback period**
	steam containers				
Overall system	Appropriate dimensioning of heat generator according to heat requirements	variable	medium-high	up to 40%	5-10 Years
	Utilization of regulation and control systems	medium	low - medium		
Layout	Consideration of appropriate oven properties and process parameters	variable	variable	variable	variable
Combustion	Improved combustion systems	medium	low-medium		
Heat recovery	Heat exchanger (recuperative and regenerative)	variable	variable	up to 60%	
	Waste heat utilization: Involvement of external heat consumers	variable	variable	up to 60%	
	Use of process rest heat, e.g. for heating of warm water	simple	low - medium	up to 100%	1-5 Years
Steam, electricity	Installation of cogeneration system	variable	variable	up to 30%	variable
	Utilization of renewable energy technologies (solar thermal, photovoltaic, biomass/biogas)	medium	medium	up to 100% (fossil)	1-3 Years

Source: Promotion of Energy Efficiency in Egypt through Financial Institutions, Prepared by EUtech for KfW

* The installation of several efficient technologies at a time can influence the savings potential due to interaction

**Natural gas tariff for non-energy intensive industries: 7L.E./MBTU

Industry

The studies and surveys carried out by national and international organizations estimated that the total energy savings potential in Egypt is about 23%. Due to its high energy consumption and outdated technologies, the industrial sector holds about 40% of the total energy savings potential. Most industries can save between 10-40% of their energy consumption by relying on existing technologies available in Egypt and improving operational practices.

There are no detailed data available on energy consumption by different industrial technologies especially in small and medium enterprises. But the estimation by a EUtech study indicates that the total energy savings potential in the manufacturing industry is about 30% of the total final energy consumption of the manufacturing sector. The main energy savings can be achieved by the replacement and optimization of electric drives, compressors etc. The typical energy efficiency measures which could be implemented are shown in Table 6.

Table 6: Energy Saving Potential and Measures in Manufacturing Sector

Technology	Energy Saving Potential (as % of total consumption)
Electric Drives	10-15%
Compressors	3-5%
Chillers	3-5%
Lighting	5-10%
Auxiliary Technologies (heat)	15-20%

Source: Source: Promotion of Energy Efficiency in Egypt through Financial Institutions, Prepared by EUtech for KfW

The EUtech study further identified a variety of measures which can be applied to all types of factories and facilities to save energy and estimated the cost-benefits of implementing these measures. The findings are provided in Table 7 below.

Table 7: Measures to Improve Energy Saving of Auxiliary Technologies

Technology	Energy efficiency measure	Complexity	Investment	Energy savings*	Payback period**
Electrical motors	Use of efficient electrical motors	simple	low- high	10%	3-7 Years
	Implementation of frequency converters for electronic speed control especially for pumps and ventilators	simple	medium	30%	1-5 Years
	Replacement of over dimensioned motors	simple	low-high	5%	1-7 Years

Technology	Energy efficiency measure	Complexity	Investment	Energy savings *	Payback period**
Pumps	Change of operation mode to two pumps	simple	low - medium	12-15%	3-7 Years
Control	Selection of appropriate speed (for graded motors)	simple	low	up to 20%	1-2 Years
Compressed air systems					
Compressors	Use of speed-controlled compressors	simple	medium - high	10-40%	3-7 Years
Distribution	Periodical removal of leakages	simple	low	10-50 %	1-2 Years
Heat recovery	Making use of waste heat via heat exchange devices	simple	medium - high	40-70%	3-7 Years
Overall system	Implementation of optimized, higher-level control (for efficient operation of several compressors)	simple	medium - high	5 -20 %	5-10 Years
	Positioning of compressors in suitable location – inlet air should be as cold as possible	simple	low	2-5%	1-3Years

Source: Source: Promotion of Energy Efficiency in Egypt through Financial Institutions, Prepared by EUtech for KfW

* The installation of several efficient technologies at a time can influence the savings potential due to interaction

**Natural gas tariff for non-energy intensive industries: 7L.E./MBTU

Transport

The transport sector accounted for about 21% of total final energy consumption in 2008. In comparison with countries with similar incomes, Egypt's transportation energy consumption is on the high end. The transport sector fuel consumption per capita in Egypt was 146 liters in 2008, nearly 50% more than the average of 99 liters in other lower middle income countries. This is primarily the result of high energy intensive road transportation dominating Egypt's freight and human transport. The age of the fleet of vehicles and its associated low efficiency are an important cause of this situation. There are no data and information available on the average fuel consumption per km travelled for the different types of vehicle fleets. But the combination of factors, low fuel price, no minimum fuel efficiency standards for

new vehicles and no mandatory requirement for the retirement of old vehicles, would suggest that unit fuel consumption will be on the high side by international standards and there is considerable potential in improving energy efficiency of the vehicle fleet. Surveys conducted indicate that the transport sector could easily save 5-10% of its total energy consumption by improving vehicle maintenance and changing driving behavior.

Residential Sector

Energy consumption in the commercial and residential sector mainly includes energy used for cooling, heating, hot water, cooking, lighting and home electric appliances. In 2008, the commercial and residential sector's energy consumption amounted to more than 20 mtoe, accounting for 31% of total final energy consumption. Electricity consumption in the sector accounted for more than 50% of total electricity consumption. Over the last decade, energy consumption by the commercial and residential sector grew at an average annual rate of 7%, 2% higher than the rate for total energy consumption. With further economic development and the improvement of people's living standards, the energy consumption in the residential and commercial sector will continue to increase rapidly. Although no detailed data are available, surveys indicate that lighting and cooling are the most important end-uses of electricity. In the residential sector, lighting, fridges, TV and other entertainment account for about two thirds of consumption. In the commercial and public sector, AC and lighting combined account for about 70% of electricity consumption.

Energy efficiency measures in the residential sector could focus on the use of efficient white goods, energy efficient lighting, using solar water heaters and insulation of buildings. The estimated saving by these measures ranges from 10 to 100% (Table 8).

Table 8: Energy Saving Potential in the Residential Sector

Appliances	Energy Saving Potential
Lighting	60%
Refrigerators	20%
Washing Machines	20%
Air Conditioning	10%
Insulation, double glazing	90%
Use of Solar Water Heaters	100%

Source: Source: Promotion of Energy Efficiency in Egypt through Financial Institutions, Prepared by EUtech for KfW

There are a number of ways to reduce the energy needs for cooling and heating in buildings. Measures like insulation material and double glazing could help make the buildings much more energy efficient. In most countries around the world, there are building codes and standards that require the buildings to meet certain thermal efficiency standards. Although Egypt developed its buildings codes in 2005, they are being implemented only on a voluntary basis. If the codes were fully enforced, they could save about 20% compared with a baseline building and improve comfort in non-air-conditioned housing. In many countries, building codes and standards are gradually tightened. International experiences demonstrate that as much as 90% of energy could be saved through the implementation of strict building codes.

Government and Public Building

Water pumping, public lighting and public buildings are the main energy consumers in the government. In 2008, their consumption corresponds to about 10% of the national electricity consumption. There is great potential for energy efficiency savings through improvement of public buildings and street lighting as well as improving the public water systems. A recent estimate by KfW indicates that more than 30% of energy can be saved in public buildings and street lighting. Given the bad conditions of the water supply and sewage treatment systems; estimated energy savings potential in the water sector amounts to 80%. The various energy efficiency measures which could be implemented in public buildings and the water sector are provided in Table 9 and Table 10.

Table 9: Typical Energy Efficiency Measures for the Residential Sector

Area	Energy efficiency measure	Complexity	Investment	Energy savings*	Payback period
Lamps and lights	Replacement of incandescent light bulbs with energy savers (CFLs)	simple	low-medium	75%	1-2 Years
	Metal halide lamps instead of high-pressure mercury lamps	simple	low-high**	up to 80%	
	Electrical ballasts instead of magnetic ballasts in fluorescent tubes	simple	low-high**	20-30%	
	Utilization of grid luminaries as reflectors	simple	low-high**	20%	
	Replacement of T12-fluorescent tubes by T8- or better by T5-tubes	simple	low-high**	3-7%	
Control	Using motion detectors, daylight sensors and time switches (dimnable)	simple	low	30-40%	1-3 Years
Design	Using daylight where possible – transparent roof	medium	low-medium	up to 100%	variable

Area	Energy efficiency measure	Complexity	Investment	Energy savings*	Payback period
	sheets, etc.				
Energy source	Replacement of central or individual electrical water heaters with solar water heaters	simple - medium	medium	up to 100%	3-7 Years
	Replacement of electrical water heaters with gas fired boilers where possible	simple - medium	medium	ca. 70%	
Walls	Insulation of walls to reduce cooling losses	medium-high	high	40%	5-10 Years
Windows	Replacement of single-glazed windows with double-glazed windows	low-medium	medium	20%	
Ventilation and air conditioning systems					
Heat recovery	Using waste heat of air conditioning systems compressors to (pre-) heat warm water	variable	medium	up to 60%	variable
Overall system	Higher-level control to ensure the needs are adjusted to supply	complex	medium	15%	2-7 Years
	Speed control in ventilators	simple	medium	up to 30%	1-5 Years
Overall system	Higher-level control to manage peak loads in the	simple	low-medium	30%	2-5 Years

Area	Energy efficiency measure	Complexity	Investment	Energy savings*	Payback period
	cooling demand				
Heat recovery	Using waste heat of compressors of cooling devices to (pre-) heat warm water	simple	low-medium	40-60%	3-7 Years

Source: Promotion of Energy Efficiency in Egypt through Financial Institutions, Prepared by EUtech for KfW

* The installation of several efficient technologies at a time can influence the savings potential due to interaction

** Depends on quantity

*** Electricity tariff residential sector monthly consumption 350 – 650 kWh: 24 Pt/kWh

**** Natural gas tariff residential sector: 30 Pt/m³

Table 10: Energy Efficiency Measures in Public Water Systems

Energy efficiency measure	Complexity	Area	Investment	Energy savings*
Reactive power reduction by installing capacitors banks	medium	Electrical system	medium - high	
Change of operation mode to two pumps	simple	Pumps	low-medium	12-15%
Replacement of the lower efficiency pump	simple	Pumps	medium	10%
Selection of appropriate speed (for graded motors)	simple	Control	low	up to 20%

Source: Promotion of Energy Efficiency in Egypt through Financial Institutions, Prepared by EUtech for KfW

* The installation of several efficient technologies at a time can influence the savings potential due to interaction

CHAPTER 3: THE CONTEXT FOR ENERGY EFFICIENCY

Key Initiatives and Activities

Over the past decades, the GOE has committed itself to addressing the growing problem of air pollution occurring in the country, which signaled the beginning of energy efficiency initiatives in Egypt. Various initiatives have been undertaken since the late 1980s regarding energy efficiency improvement, mainly.

- From late 1980s to late 1990s, the USAID assisted the Egyptian government in promoting energy conservation and reducing polluting emissions, mainly through two specific initiatives, the Cairo Air Improvement Project and the Egyptian Environmental Policy Program (EPPP). The primary focus of the project was to promote the application of 10 proven technologies in Egypt's industrial sector. Over the 10-year implementation period, a total of 200 energy audits were carried out for various industrial processes and entities, 30 demonstration projects were implemented, and 120 training sessions were conducted for 1200 trainees.
- From 1999 to 2010, the UNDP, through a GEF grant, has been promoting the energy service industry as a way of establishing a sustainable EE market in the Egyptian industrial and commercial sectors. The Energy Efficiency Improvement and Greenhouse Gas Reduction Project (EEIGGR) consists of three different components: (i) loss reduction on the national grid and demand-side management, (ii) market support for EE businesses and energy codes and standards, and (iii) promotion of cogeneration. During the past 10 years, the project supported: (i) energy audits in industrial, government, and commercial buildings; (ii) implementation of pilot projects; (iii) the creation of Energy Service Companies (ESCOs); and (iv) the development of building codes and standards for appliances.
- The Egypt National Cleaner Production Center (ENCPC) was established as a service provider to industry supported by the Ministry of Trade and Industry in close cooperation with the United Nations Industrial Development Organization (UNIDO). ENCPC has been providing training to energy managers, conducting energy audits and supporting the implementation of energy efficiency measures in industrial facilities.
- The Industrial Modernization Centre (IMC) of Egypt set up the Energy Efficiency and Environment Protection Program by the end of 2007 to improve the efficient use of energy and encourage the use of renewable energy as a source of energy in industrial establishments through technical and financial support to the industrial establishments. IMC works under the auspices of the Ministry of Industry and Trade and operates with funds provided by the European Union, GOE and the private sector.
- The Egypt Electricity Holding Company (EEHC) launched a major program of promoting the use of CFLs to replace incandescent lamps. The program is implemented by EEHC's subsidiaries, the local distribution companies. The distribution companies provide CFLs to low income households at half of the market price. The price difference is absorbed by the distribution companies.

A detailed description of the past and ongoing energy efficiency initiatives and activities undertaken by the various donors and the government agencies are provided in Appendix II.

Major Achievements

There has been no systematic evaluation of the outcomes or impacts resulting from any of these initiatives. A review of available literature and interviews with some stakeholders show that these initiatives have enabled Egypt to achieve some results. Among them, the most significant and sustainable are (on a qualitative basis):

- EE standards for four domestic appliances (refrigerators, washing machines, air conditioners, and electric water heaters) were developed and implemented;
- EE building codes for new buildings were developed and the codes for the residential sector was applied on a voluntary basis in 2006;
- Energy audits provided a good indication of the potential for energy efficiency improvement in the various sectors and industrial processes;
- The demonstration projects proved the technical feasibility and cost-effectiveness of energy efficiency investments;
- The awareness of energy efficiency potential was raised, technical capacity was enhanced, and consulting capacity was developed to some extent;
- Accredited testing laboratories for appliances were built;
- A national association for ESCOs was created and became operational.
- A large CFL program was implemented and more than 6 million CFLs have been distributed to households to replace candecent lights.

Noticeable Shortcomings

However, the overall impact of these initiatives and activities appears to be limited. There are, so far, no quantitative results of what has been achieved under these initiatives. Most importantly, failures to achieve certain sustainable results in key areas have been noticed:

- Although many demonstration projects were implemented to prove the technical feasibility of energy efficiency investments in various segments, there has been no large-scale replication of these projects. Most of the demonstration projects were entirely financed by grants under these programs and failed to stimulate investment activities by the businesses and industries;
- Despite the efforts of both USAID and UNDP/GEF EEIGGR projects to develop a market for intermediaries such as the ESCOs business or adapted financing from commercial banks, the ESCO industry in Egypt as well as the banking sector remain under-resourced. The few existing ESCOs are under-capitalized and have difficulty accessing financing;
- Many of the initiatives and activities focused on market-based programs to promote energy efficiency investment by industrial entities, while the prevailing low energy prices did not justify such investment;
- No efforts were made to monitor how those EE initiatives and programs were implemented and to assess whether they achieved the expected targets and outcomes;

- Only the building code for residential sector was approved for implementation on a voluntary basis. No mechanism and institutional capacity have been developed to monitor its implementation and/or evaluate the impact;
- Only four of the standards developed for appliances have been implemented. There is neither the capacity nor procedure in place to ensure compliance with the standards implemented. Moreover, the demand for energy-efficient appliances promoted through the standards is still low due to the lack of consumer awareness;
- Although some attempts were made, these initiatives have not resulted in the creation and implementation of a clear regulatory and institutional framework which could support and sustain energy efficiency activities and programs;
- Most initiatives and activities were undertaken between the donors and the quasi-government entities, there appears to be a lack of participation and support from the key policy making government bodies;
- The lack of cost reflective energy prices to encourage energy efficiency investment through the market and the lack of government involvement and support to promote energy efficiency through regulation limited the achievement of any sustainable outcomes.

The Regulatory and Legal Framework

The weakness of the institutional, regulatory and policy framework for EE in Egypt are illustrated by the following aspects:

Energy Pricing Policy

Like in many developing countries, energy prices in Egypt are administered and tightly controlled by the government rather than being determined by the market. Energy products are treated more as public goods than as commodities. Consequently the prices of energy products are based on factors like social and political considerations, instead of just on the economic costs of supplying these products. All energy products are priced not only far below comparable international levels, but also below the financial costs of producing and supplying these products. Even compared with most countries in the Middle East and North Africa region, Egypt's prices for oil products and electricity are on the low side. Subsidies to the Egyptian energy sector are substantial. Egypt has both large on- and –off budget subsidies, respectively at 6.9 percent and 5.0 percent of GDP in 2006. Direct budgetary transfers for subsidies were EGP 64.5 billion in the 2007-2008 budget, up from EGP 51 billion in the previous year. In 2008-2009 the total fell to some EGP 40 billion, because of the fall in international prices, which is not going to be sustainable based on previsions of the future cost of energy. It is estimated that indirect subsidies are probably comparable. For several years, the government has planned to phase out energy subsidies and as result, energy prices have gradually increased since 2004 and are expected to continue to increase over the next years. Even though power sector reform has the goal of reducing subsidies for all but low-income households, subsidized electricity tariffs for almost all category of consumers, except probably commercial users, still create substantial disincentives to the adoption of energy efficiency measures.

Institutional Framework

In 1983 the Organization of Energy Planning (OEP) was established to have an overall responsibility for the energy sector. The main mission of the OEP is to analyze energy sector development and propose energy strategies and policies. One of the OEP's objectives was to promote the efficient use of energy. It played a major role in OEP in raising the profile of EE in Egypt through data collection, EE potential analysis, pilot projects, capacity building, awareness campaigns, energy audits and standard and label programs. However, OEP has ceased operation since 2005.

Currently in Egypt, there is no overarching ministry which has overall responsibility for developing and coordinating the national energy strategy and policy. Instead, the responsibility for the energy sector is primarily shared between the Ministry of Electricity and Energy (MOEE) and the Ministry of Petroleum (MOP). The MOEE is primarily responsible for overseeing the development and operation of the power sector to ensure adequate power supply to meet the needs of economic development. The MOP is primarily responsible for the exploration, development and operation of the petroleum and gas sector to satisfy the country's demand for petroleum products and gas. The **Supreme Council of Energy (SCE)**, whose members consist of key government ministries and which directly comes under the Prime Minister Cabinet, is to provide overall guidance on energy sector strategy and energy sector policy. The Electricity Regulatory Agency established in 2000 is to supervise the implementation of power sector policies and monitor sector performance. But ERA does not have any authority over price issues, contrary to the norm in most countries in the world.

As energy efficiency is increasingly directly linked to environmental improvements, the Ministry of Environment is also one of the most important political players in this field. The ministry is independent from other ministries and is responsible for the environmental policies in Egypt and their monitoring. Its main executing agency is the Egyptian Environmental Affairs Agency (EEAA) which is also involved in environmental programmes financed by international donors and organizations (e.g. EPAP II and PPSI). EEAA established a department for energy efficiency issues. The department is little active at the moment.

Therefore, there currently appears no dedicated national EE agency which has the mandate and authority to plan, develop and implement energy efficiency strategy and programs. The **Supreme Council of Energy** set up its own EE unit in May 2009. This entity was created with the aim of streamlining EE activities nationally and fulfilling the national EE target of an 8.3% reduction in energy use by 2022. However, it is not very clear whether the EE unit has the formal authority to coordinate activities related to EE in the country. Furthermore, the Unit currently is not supported by an adequate number of professional staff with sufficient budget resources. If the EE unit would play the role of leading and coordinating EE activities on behalf of the GOE, its mandates need to be clarified and formalized. It needs to be staffed with adequate professionals with sufficient technical capacity and provided with financial resources to carry out its mandates and perform its functions.

Policies and Regulations

Egypt lacks strong EE policies and regulations. At the moment, there are no EE laws effective at the national level. There are no regulations, any explicit policies or incentives which promote investment in energy efficiency activities, facilitate the deployment of energy efficient equipment and appliances and encourage energy saving behavior by consumers. A draft law on EE was proposed through the UNDP/GEF Energy Efficiency Improvement and Greenhouse Gas Reduction (EEIGGR) project, but

never adopted. However, there are some important provisions of the recent draft electricity law that will show the way of EE development in Egypt for the upcoming years. The Draft Electricity Law 2009:

- Obliges the competent ministry to design policies aimed at expanding the application of efficient equipment and replacing low-efficiency appliances;
- Requires owners of transmission and distribution licenses to prepare and conform to the annual plan to carry out EE projects or programs.

In February 2008, a national strategy for EE was adopted by the SCE with the objective of reducing energy use by 8.3% by 2020. The EE unit of the SCE is responsible for coordinating the activities surrounding the fulfillment of this target. But so far no detailed strategy has been mapped out as to how this target will be achieved and no policy and incentive measures have been put in place to support the achievement of said target.

Codes, Standards, Labeling and Indicators

Although efforts have been made by the donors over the past decade to help develop codes, standards and labeling for buildings and appliances, only standards for four domestic appliances (refrigerators, washing machines, air conditioners, and electric water heaters) have been implemented. Compliance with these standards has not been evaluated regularly and there has not been any systematic procedure to ensure compliance with labels and to detect fraud. Only testing laboratories for the targeted appliances as well as for efficiency lighting equipment – Compact Fluorescent Lights (CFLs) and ballasts – have been implemented. The New and Renewable Energy Authority (NREA) is the institution responsible for the testing laboratories, the testing of appliances, and issuing of labels according to the measured performance of each model. The Draft Electricity Law 2009 obliges the competent ministry to design policies to expand the application of EE equipment and appliances but it has not yet been adopted. While the EE residential building code was issued in 2006, its implementation is still voluntary. The EE commercial and government building code is still being reviewed. There are currently no minimum fuel efficiency standards for new vehicles and no mandatory requirement for old inefficient vehicles. While some efforts have recently been made to develop indicators for the industrial sector, no EE standards for major equipment (motors, compressors etc.) exist and no quality indicators are available for the different industrial processes and products to evaluate and benchmark their energy consumption with their local and international competitors.

Barriers to Energy Efficiency Improvement

As in other countries, even if there is significant potential for EE, numerous constraints and a host of barriers are limiting EE development. The number of barriers appears to be larger in Egypt than in most countries. The following barriers can be identified as key elements that should be addressed by the GOE in order to enable the development of EE in the country.

Lack of Effective Actions by the Government to Address EE

The GOE has traditionally focused on the supply side to meet growing energy demand. Although some attention has been devoted to EE matters by the government in recent years, there are no

concrete actions taken by the government to address EE as an integral part of its overall energy strategy. The government has only vaguely indicated its intention to reduce energy consumption by 20% over the 2007 level. However, the target and the baseline are very confusing. No clear strategy has been developed to achieve this target and no concrete actions have been taken to support the achievement of said target. The lack of actions by the government sends the wrong signal to the stakeholders and general public as well.

Low Energy Prices

It is well established that energy demand in a country is price sensitive and a rational pricing policy is the key to reducing energy waste and encouraging energy efficiency investment. Investments in EE are hindered by low energy prices, which historically have been heavily subsidized. Energy subsidies are a major reason for the relatively high level of energy consumption as subsidies encourage the inefficient use of energy. As a result, a disincentive to invest in EE projects has been present in the market since below-market energy prices artificially extend the payback periods of EE projects or even make the EE uneconomic. The low energy price is the single most important factor preventing the use of market forces to stimulate energy efficiency activities, investment and behavioral changes in Egypt. On the positive side, the GOE has been gradually increasing energy prices since 2004, with the aim of eventually reaching to cost recovery levels.

Weak Legal and Regulatory Framework

The absence of an enabling legal and regulatory framework to guide and regulate energy efficiency activities is one of the reasons why there are no sustained energy efficiency programs in Egypt. There have been no EE laws and decrees, no national EE strategies, plans and regulatory regimes. The legal and regulatory framework can provide overall direction for national energy efficiency strategies and policies. It could also specify time-bound targets and interventions to be undertaken, often at the level of consuming sectors, producers and industries. Laws and decrees can bring stronger legitimacy to organizations and their work, and provide assignment of functions and responsibilities. Laws and decrees can provide the legal authority for any intervention strategy, whether administrative tools (requirements for producers or consumers) or fiscal incentives (such as tax breaks). Laws and decrees may also specify necessary resources, including government funding and implementation arrangements.

Lack of an Institutional Champion to Lead and Promote EE

There are significant weaknesses and deficiencies in the institutional setup with regard to EE in Egypt. Development of dedicated institutions responsible for formulating an effective national EE strategy, developing quantifiable objectives and targets, proposing tools and legislation, monitoring and following up achievements, assessing impacts, and accumulating experiences and lessons learned to modify and improve future plans is in very early stages. As there is no specific organization, which is adequately staffed and funded, responsible for setting up and/or implementing energy saving plans and objectives in Egypt, Egypt does not have a declared "official" target for energy savings in any sector of the economy, although some ministries may have their own program for EE. Previously, the overall coordination was handled by the Organization of Energy Planning (OEP), which ceased to exist in 2006. Another result of this situation is the absence of good and relevant statistics and

indicators on the energy consumption situation in Egypt, which prevents decision makers from being able to address and identify the important deficiencies in the sector. The recently created EE unit within the SCE is an encouraging sign of the readiness of the GOE to address the important institutional weaknesses.

Absence of Policies, Incentives and Financial Measures

Well-designed energy policies and incentives can stimulate investment in EE projects by end users, promote the development and deployment of energy efficient equipment and appliances and induce behavioral changes. Taxes and duties can be designed to encourage the import and deployment of the most energy efficient equipment and products in the Egyptian market, and discourage the production and export of energy intensive products. Tax credits and financial incentives can be implemented to promote the market penetration of newly deployed energy efficient products. Punitive energy tariffs can be used to prevent excessive energy use and energy waste. Cost sharing policies can be designed and low interest loans can be provided to support the research, development and deployment of new energy saving products. Similar policies can be used to support the undertaking of high-risk demonstration projects for new technologies. There is a wide array of policies and incentives which can be applied to promote energy savings investment and behavior by end users. But none of these have been implemented in Egypt yet.

Lack of Dedicated Funding to Promote and Support EE Activities

Almost all activities related to EE in Egypt have been supported by grant funding from bilateral and multilateral agencies. On the government side, there are no dedicated and stable funding sources to promote and support EE activities and programs. Currently, the only EE related funding available is a joint fund established by the European Union, GOE, and Egyptian private sector with a total amount of about EGP 500 million; the IMC provides financial incentives to industries in order to improve productivity and reduce the impact on the environment which includes the reduction of energy consumption. Once a project or program supported by a donor grant ends, all activities come to an end. At present, there is no other funding available to support energy audits, benchmarking, studies, co-financing of feasibility studies, and the realization of demonstration projects that could trigger the interest of the market. No subsidy mechanism exists to promote the development and deployment of energy efficient equipment and appliances.

Under Utilization of Utilities in Promoting and Implementing EE Initiatives

Utilities have not been active in the EE market in Egypt, as opposed to many countries that heavily rely on such partners being key actors in such initiatives. On a small-scale level, two utilities, the Alexandria and the North Cairo ones, have already initiated some programs on their own; financing the replacement of some specific equipment along with an installment payment mechanism on the client's energy bill, and the development of a CFL distribution program for their employees first, and some of their clients at a later stage. But unfortunately, such initiatives have been limited in scope and in impacts.

It is interesting to note that such an approach could be the best one for the use of carbon financing for EE projects, as individual projects, even big ones, are often too small to be considered interesting

under the current Clean Development Mechanism (CDM). On the other hand, the use of the programmatic approach, as well practiced and promoted by the World Bank, could be used to provide some of the necessary incentives for the utilities to launch such programs.

Unavailability of Adapted Financing for EE Projects

There is a lack of availability of financing for EE projects. Indeed, Banks in Egypt, lacking the technical resources or the experience to recognize the cost benefits of EE projects, perceive these as high risk projects. Financing options are typically confined to traditional loans with unfavorable lending terms, which limit the size and the number of EE projects to be conducted. However, interest rates seem to be at the market level in Egypt although transaction costs increase with the risk perceived by the banks. A small partial guarantee fund (USD 280k) was developed under the UNDP/GEF EEIGGR project and was quite successful in addressing the different barriers to EE financing, but had a very limited impact due to its limited size.

As a result, end-users, having limited experience in EE project financing, are using internal funds or operational budgets to implement their projects rather than using commercial lending, limiting the number and size of EE projects implemented.

Lack of Intermediaries and Technical Capacity

In order for an EE market to function properly, solid technical capacity and a wide variety of intermediaries have to be present in order to develop, propose, and implement EE solutions. Such intermediaries can take the form of equipment distributors, consulting engineers, construction entrepreneurs, and Energy Service Companies (ESCOs) to name a few. The current situation in Egypt shows that there is a significant lack of such intermediaries supporting the development of a sustainable EE market at this time, therefore requiring more institutional interventions, which are neither sufficient nor effective at this time.

Even though both USAID and UNDP/GEF EEIGGR projects have tried to develop the ESCO business in Egypt and a national association was established, the ESCO industry in Egypt remains under-resourced, coming down to only a few companies, and only a few EE projects have been implemented under this concept. Moreover, even if 60 engineers were trained in the field of energy audits under the EEIGGR project, Egypt still lacks trained technical experts to perform audits, design, and implement projects or to develop projects within their own facilities, that is in the building or industrial sectors.

Lack of Information and Awareness

Multiple information market failures have been identified as inhibiting investments in EE in Egypt. Among them are the lack of information, the accuracy of the information, the capacity for information dissemination, and the end users access to information. Although data are available on the total primary energy and final energy consumption in the country, there are no reliable and detailed statistics on consumption by sectors and industries. Detailed information on energy consumption by key industry sectors, key industrial processes and equipment, and main appliances are completely lacking. There have been hardly any efforts to benchmark energy use by key industrial processes and equipment against international best practices. The lack of detailed information about EE potential

prevents awareness of potential EE opportunities. An EE center to promote awareness and strategic action on EE was created under the UNDP/GEF EEIGGR project but it is not clear who will manage the center's activities and it seems to have stopped functioning after the end of the project.

CHAPTER 4: RECOMMENDATIONS FOR IMPROVING EE

Energy efficiency is rapidly becoming a critical policy tool around the world to help balance energy supply and demand. The decades of experiences from both developed and developing countries indicate that EE programs and investments often generate multiple benefits for the government, producers and consumers. Improving energy efficiency is one of the lowest-cost options to reduce energy demand. It is also a cost-effective way to help mitigate local air pollution which is becoming a serious problem in Egypt. Energy efficiency improvements can also yield the greatest contribution to mitigating the growth of carbon dioxide emissions which contribute to global warming (Figure 9). Greater energy efficiency helps enhance energy supply security and spurs new economic activities, thus creating new job opportunities. The same amount of investment in energy efficiency is found to create more jobs than in most other activities (Figure 10).

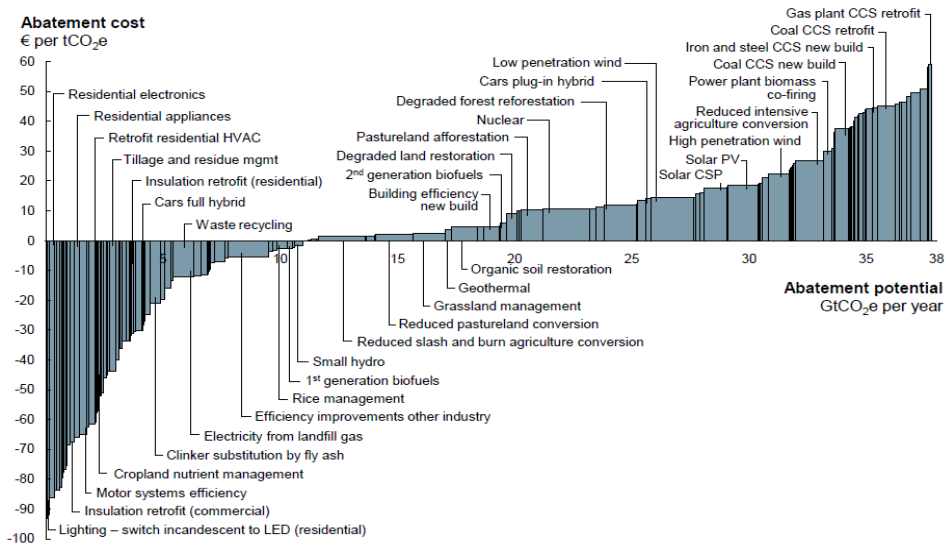
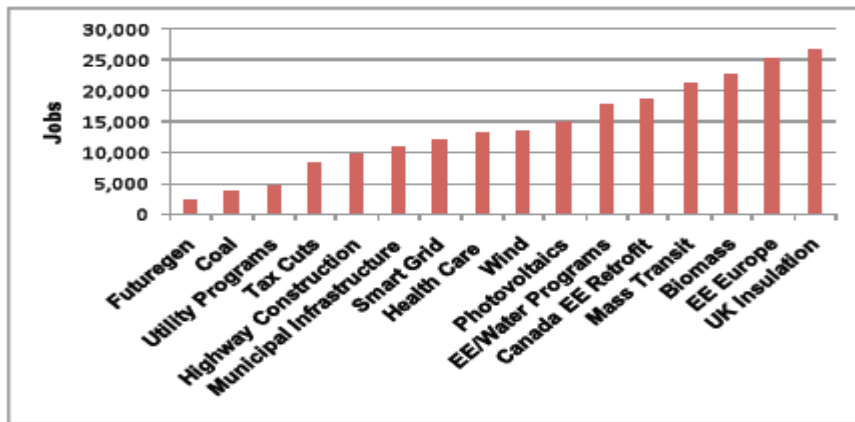


Figure 9: Global Marginal GHG Abatement Cost Curves - 2030

Figure EX-3: Jobs Generated Per Billion Dollars of Expenditure on Selected Programs (billion constant 2008 U.S. dollars)



Source: Management Information Services, Inc., 2009

Figure 10: Impact of Energy Efficiency Investment on Job Creation

The potential energy savings across the economy of Egypt are huge and remain largely untapped. But achieving potential energy savings does not happen automatically. Energy efficiency improvements are impeded by a series of barriers. All countries that have had success in promoting energy efficiency use a mix of government regulations combined with policies and programs that encourage energy efficiency investment through the market (Box 4.1). Egypt can be no exception, and needs to develop a set of administrative and regulatory measures and implement them effectively. Egypt also needs to develop and implement a variety of market-based programs that spur energy efficiency investments and induce behavioral changes.

Box 4.1: A Mix of Instruments Required to Remove Barriers to Energy Efficiency

Make certain that the energy price reflects the costs of supplying the energy and, at the same time, ensure that decision makers actually see the price signals and can benefit from reacting to them;

Provide information to decision makers in order to improve their ability to actually consider the costs and benefits of efficiency;

Use regulatory measures and financial instruments where market facilities or barriers are too complex to overcome;

Evaluate policies on a regular basis to encourage efficient consumer actions and to ensure that energy saving are indeed occurring;

Promote research to develop more efficient products. These innovations often lead to a greater diffusion of products as a result of wider technical applicability or lower costs;

In the case of internationally traded products and in certain other situations, efficiency measures can be introduced more quickly, at lower costs, through international co-ordination of test procedures and specifications.

Source: IEA 2006 Review – Energy Policies of IEA Countries

Recommendations

Based on well documented international experience and the analysis of the Egyptian energy efficiency framework and current status, it is recommended that the GOE should take a set of actions and introduce different measures to address the currently identified barriers related to the energy efficiency situation in the country:

- Develop a comprehensive energy data and statistics system
- Eliminate energy subsidies and gradually increase energy prices to market levels
- Improve institutional structures for energy efficiency and strengthen their capacity
- Develop and implement a legal, regulatory and policy framework
- Increase awareness levels of all stakeholders
- Address market failures by supporting the development of demonstration projects and the presence and the capacity of intermediaries
- Use utilities as executing agencies for energy efficiency activities

- Support the introduction of an adapted EE financing mechanism
- Set priorities in the sectors to be addressed and develop plans and programs

Develop a Reliable Energy Data and Information System

Currently the MOEE and MOP are respectively responsible for electricity production and oil and gas production. They have detailed data and information on the total amount of energy products which have been produced, transmitted and delivered. However, even on the national level, there are no reliable energy data and information about final energy consumption by different sectors and different industries. Without such data, it is difficult to evaluate how effectively energy products have been utilized to produce economic outputs by the various segments of the economy and to assess the potential for energy efficiency improvement. Detailed and reliable energy data by subsectors, industries and type of uses are the basis for benchmarking and developing energy efficiency plans and programs. Reliable energy consumption data could also help policy makers monitor the energy consumption trend by sectors and industries and enable them to develop related economic and energy policies.

It is therefore recommended that: the GOE should develop and implement a comprehensive and reliable energy data and information system to collect and monitor final energy consumption by various end-users throughout society.

Continue Energy Price Reform

One of the main elements in the development of a sustainable energy efficiency market is the use of cost-recovery energy prices, instead of subsidized ones. Getting the price signal right is an important element in encouraging appropriate efficiency investments. Indeed, increased energy costs will directly improve the return on investment of energy efficiency projects, making them a lot more attractive to end users and promoters. As the energy efficiency market has been identified as very sensitive to price increases, such increases will become one of the key drivers of the energy efficiency market's development and sustainability, on top of the other benefits related to an unsubsidized price structure for the country. When energy prices reflect the cost of supply and consumers can directly respond to price signals, significant behavioral changes will occur.

While raising energy prices to cost recovery levels brings many benefits such as improved energy efficiency and reduced fiscal subsidy, it could also bring substantial adverse political and social impacts. In particular, the welfare of the poor households from energy price increase needs to be protected. International experiences demonstrate that the best way to limit the social and political effects of removing subsidies is to accompany energy price reform with the implementation of a well targeted social protection program funded by government budget. It is beyond the scope of this study to discuss how the program should be designed and implemented⁶. The other option, which can be implemented as a complement or alternative as appropriate, is a well-targeted pricing structure, such as rising block-tariff structure for residential users that would subsidize less energy-consuming households through higher prices on high energy consumption.

⁶ The study on energy pricing in Egypt, completed in June 2009 under ESMAP financing and conducted by Kantor Management Company, discusses this issue in more detail.

It is therefore recommended that the GOE continue and accelerate the program of adjusting energy prices toward cost-reflective levels. Such program should include social protection measures to mitigate the impact of price adjustments on poor.

Improve Institutional Framework

International practice is to have a dedicated energy efficiency agency with a clear mandate and an appropriate budget to develop energy efficiency strategies, propose targets, programs and policies, and coordinate and monitor their implementation, progress and impact (Box 4.2). In many countries, the establishment of a dedicated institutional EE entity has been the first step in achieving widespread scale-up of EE activities and programs.

Box 4.2: Lessons from Successful Energy Efficiency Practices in OECD Countries

Energy efficiency should receive a higher profile in the national energy policy;

Energy efficiency policies should be promoted by developing a comprehensive strategy with clear targets, realistic timetables and concrete policies and measures;

Setting up a special institution, or giving responsibility for implementing and supporting energy efficiency to an existing body which is independent of central government budgetary constraints, could be instrumental in achieving successful policies;

The impact of energy efficiency policies and measures should be closely monitored and assessed

Source: IEA 2006 Review – Energy Policies of IEA Countries

Dedicated EE agencies are typically responsible for identifying on a continuous basis the evolving barriers that limit the development of the EE market; developing and proposing EE policies; designing and administering programs and regulations focusing on market transformation; supporting research and development in EE technologies; monitoring activity progress; and developing and/or ensuring compliance with regulations such as codes and standards. These dedicated entities coordinate the various activities related to EE within a country. Nonetheless, such a single organization is not necessarily the only institution playing a role in the EE field. For instance, when fiscal incentives are adopted in a country, they are often managed by the organization responsible for taxation. When standards and codes are to be promoted, they are developed and implemented by agencies for standardization or the sector ministries. The dedicated entity, however, could, e.g., help with technical evaluation of the proposed regulations, standard and codes.

According to an analysis of institutional frameworks for EE implementation recently published by the World Bank⁷, all of the EE agencies in the twenty-seven developed and developing countries analyzed fell within one of 7 distinct institutional models. Each of the 7 institutional models has inherent advantages and limitations (Table 4.1). Most of the EE institutions are funded by government, budget

⁷ The World Bank - ESMAP, "An Analytical Compendium of Institutional Frameworks for Energy Efficiency Implementation", Formal Report 331/08, October 2008, 143 pages.

or special charges, whether they have policy functions or not depend largely on the models of institutions (Table 4.2).

Despite the considerable variation in ownership, structure, function among these agencies, a number of common features and core competencies important to EE implementation are identified:

- The older EE agencies, established during 1990s, were mainly broad-based national energy agencies while, in more recent years, specialized agencies focused on EE and related clean energy investments are found more common.
- Regulatory interventions, such as building codes, standards and labeling programs, are most effective when implemented by dedicated government agencies or statutory agencies.
- Competencies that dedicated EE entities should have are, among others, the ability to work collaboratively with multiple public and private agencies with EE responsibilities, the ability to leverage the participation of the private sector in EE implementation, effectively engage with EE stakeholders, influence energy goods and services providers (including utilities and ESCOs), as well as facilitate the role of energy regulators in scaling up EE
- Dedicated government agencies should have independence and flexibility in decision making concerning adequate resources, including staff and funding and should have a credible scheme for monitoring results. Furthermore, their operational and program funding should not be linked to government budgets.
- Such agencies should have good representation at the higher government levels in order to obtain the cooperation of ministries and governmental organizations and they should be in charge of:
 - Developing and managing the improved framework to be put in place.
 - Developing indicators to identify the opportunities and monitor the progress being made on the objectives set.
 - Take the lead in developing, adopting, implementing and monitoring the necessary regulations in regard to an EE law, building code, and standards and labeling, among other regulations.
 - Become the executing agency in regard to all awareness, information dissemination and capacity building activities to be developed and implemented.
 - Promote EE in coordinating the efforts of the different donors, as well as prioritizing them in light of the national plan to be adopted.

Table 4.1: Advantages and Limitations of Institutional Models for EE Implementation

Model	Advantages	Limitations
1. Government agency with broad energy responsibilities	There is greater credibility with stakeholders Government agencies have access to public funds There is integration of EE within broad sector objectives	EE must compete with other energy programs for resources and management attention Large bureaucracy may impede decision making It is difficult to retain staff
2. Government agency focusing primarily on EE/RE/SE	Agency focus is consistent with EE It is easier to attract dedicated staff Agency provides greater voice in sector policy and obtaining resources	Narrower focus provides less clout Potential for competition between technologies(EE/RE)
3. Government agency focusing entirely on EE	There is opportunity to create pro-EE agency culture It is easier to attract dedicated staff and dynamic management There is possible leveraging of other resources	Narrower focus provides less clout Success is highly dependent on effective top management Agency may be isolated from broad energy policy agenda Agency must compete for resources
4. Independent statutory authority (ISA) focused on EE	Independence facilitates operational discretion There is flexibility in accessing outside advice and support ISAs have flexibility in hiring management and staff ISAs have flexibility in fund raising and decision making	Agency may not be viewed as mainstream There is potential competition between ISA and public agencies ISAs have less direct access to public funding Changing scope may require legislation
5. Independent corporation focused on EE	Independence facilitates operational discretion Independent corporations can access private-sector talent and technical capacity They have the ability to form JVs and subsidiaries There is flexibility in obtaining external inputs and funds	Independent corporations have less direct access to public funding Board selection and composition will determine effectiveness Agency may not be viewed as mainstream Potential competition between ISA and public agencies
6. Public/private partnership focused on EE	Partnerships have flexibility in obtaining external inputs and funds Independence allows greater freedom and flexibility in decisions	There are potential conflicts between public and private perspectives Partnerships have less direct access to public funding
7. Nongovernmental organization focused on EE	NGOs have greater credibility with some stakeholders They may attract dedicated staff and management EE focus helps build core competencies There is flexibility to obtain external inputs and funding	NGOs have less direct access to public funding Some stakeholders may find NGO not credible NGO governance structure may impose other strictures

Source: An Analytical Compendium of Institutional Frameworks for Energy Efficiency Implementation – ESMAP Report

Table 4.2: Source of Funding and Policy Features of EE Institutions

Model	Policy Role	Source of Funding	Examples
1. Government agency with broad energy responsibilities	All have strategy and policy formulation functions	Government budget	US, Demark, Japan, China
2. Government agency focusing primarily on EE/RE/SE	One group functions like government ministry with policy functions, the other group is semi-government ministry responsible only for policy implementation and monitoring	Most funded fully by government, a few in developing countries funded partly by donor grants	Australia, Czech Republic, France, Mongolia, Netherlands, Norway, Sweden
3. Government agency focusing entirely on EE	One group functions like government ministry with policy functions, the other group is semi-government ministry responsible only for policy implementation and monitoring	Most funded by government budget, with a few in developing countries supplemented by fees and donor grants	Brazil, Canada, India, New Zealand, Serbia, Thailand
4. Independent statutory authority (ISA) focused on EE	No policy function	Funded by government budget, donor grants, fees and private sector	Greece, Ireland, Sri Lanka, United Kingdom
5. Independent corporation focused on EE	No policy function	Funded by government and fees	Finland, Korea, South Africa
6. Public/private partnership focused on EE	No policy function	Funded by projects with government support	Poland, Germany
7. Nongovernmental organization focused on EE	No policy function	Government, fees, grants	Austria, Croatia

Source: An Analytical Compendium of Institutional Frameworks for Energy Efficiency Implementation – ESMAP Report

These different conclusions highlight the importance of credibility and clear delegation of statutory authority as important reasons for public agency involvement in EE implementation, and should be considered by the GOE in the development of a new institutional framework to address the current deficient situation in Egypt.

It is therefore recommended that a dedicated institutional structure should be created (or an existing institution be given the mandate) to coordinate and promote all EE activities at the national level and that it would be set up in line with international best practices.

Case Study: Thailand's Department of Alternative Energy Development and Efficiency⁸

In Thailand, the fast-evolving commercial and industrial sectors, together with consistent population growth, constantly escalated energy demand. Nevertheless, domestic sources of supply have remained limited, which has forced the country to significantly rely on imports. This high dependency was the main reason why Thailand prioritized EE as a main energy strategy, leading to the creation of a dedicated agency entirely focused on EE matters.

The Department of Alternative Energy Development and Efficiency (DEDE) is a government agency operating under the Ministry of Industry. DEDE's mission is to support and promote EE, provide the energy sources, develop the options of integrated energy uses as alternative sources for adequately demand responsive to every sector at optimal costs beneficial to the country's development and improving living standards for the Thai people. The DEDE has more than 1,500 employees actively pursuing EE activities in various areas such as consumer awareness campaigns, training sessions, energy research and development, industrial energy audits, EE demonstration projects, and end-use studies. Most of the EE policies and programs implemented so far have focused on residential and commercial buildings, transportation, and industrial sectors, the largest consumers of the total final energy consumption.

One of DEDE's major interventions was conducted under the Energy Conservation and Promotion Act (ENCON). The Agency was then responsible for the compulsory program which consisted of a large public awareness campaign for promoting EE as well as in providing support to government buildings and existing designated factories and buildings for investments in EE. Moreover, having noticed the fact that FIs were not familiar with EE projects, which was limiting the ENCON program, DEDE decided to establish an EE Revolving Fund to promote and push investment in EE projects, as well as to increase the confidence of FIs in lending for EE projects.

In fact, results from the ENCON program under DEDE were significant. From 1995 to 2004, with a total investment of 10,540 million baht, the program helped to reduce 232 MW in energy demand, which is equivalent to 1,809.46 million baht per year in total energy expenditure savings.

Improve the Legal, Regulatory and Policy Framework

The presence of a well-developed legal and regulatory framework is a cornerstone to achieving any substantial progress in EE in any country, and this conclusion applies equally to Egypt. The enactment of an energy efficiency law will be essential in providing the necessary foundation for instituting and enforcing regulations, providing legitimacy to organizations and their work, and assigning responsibilities and funding. Enactment of the law can send a clear message to society and the market on national intentions. Even with the enactment of the law, many policies, regulations, codes and standards need to be developed and implemented. The successful policy tools, regulations and measures need to be adapted to the specifics of the sectors involved (Box 3.3). Indeed, an adapted legal, regulatory and policy framework would introduce the right conditions to eliminate bad practices in the market and generate rapid and sustainable improvements of EE in the country. The World Bank has concluded that most successful countries in EE have reviewed their energy strategies to include such code and standards⁹. As these sets of policies and regulations are considered to be some of the most long term effective approaches in increasing the level of EE in a country in the long run, they should be considered by the GOE as a priority.

⁸ The Department of Alternative Energy Development and Efficiency (DEDE) Official website: www.dede.go.th.

⁹ The World Bank - ESMAP, "An Analytical Compendium of Institutional Frameworks for Energy Efficiency Implementation", Formal Report 331/08, October 2008, 5 pages.

Box 4.3: Successful Energy Efficiency Policies in OECD Countries

Industry

Monitoring energy consumption trends and exploring efficiency potentials are crucial in designing policies for the industrial sector;

Voluntary agreements with industries should have wide coverage and clear and measurable targets, and in particular aim for savings beyond business-as-usual. If they fail, they should be replaced by mandatory measures.

Government procurement can play a significant role in encouraging the uptake of energy-efficient products.

Energy audits are an important tool in shaping awareness for industrial and commercial energy users

Transport

The tightening of fuel efficiency standards is instrumental. Furthermore, the efficiency of specific components, which may not be captured in the current fuel efficiency tests, needs to be addressed.

Road charging and regulations can be effective (while their net impacts remain to be seen).

Vehicle taxation based on fuel efficiency or CO₂ emissions, rather than on engine size or vehicle weight, is instrumental.

Eco-driving lessons can be cost-effective means to achieve savings.

Buildings and Appliances

Tight minimum efficiency standards with wide coverage of products are instrumental. The conditions of energy efficiency tests need to reflect realistic predictions of actual energy use.

38% of global lighting electricity consumption could be saved cost-effectively by the widespread adoption of efficient lighting technology and practices.

Stringent building codes, which are strengthened over time with predictability, are effective.

Relatively simple energy saving obligations on energy suppliers seem to be working. The impact of the more sophisticated White certificate scheme remains to be seen.

Source: IEA 2006 Review – Energy Policies of IEA Countries

It is therefore recommended that the GOE:

- Adopt a clear EE law to act as the reference for all future national initiatives.
- Enforce the current building codes and equipment standards already adopted.
- Continue the development, the implementation and at some point the enforcement of more aggressive building codes, appliance standards and labeling as well as new transport regulations.

- Develops and implements specific tariff measures and incentive policies to guide investment and consumption behavior changes.

Case Study: The Korea's Energy Standards and Labeling Programs¹⁰

The Ministry of Knowledge Economy and the Korea Energy Management Corporation (KEMCO) are currently managing three Energy Standards and Labeling Programs for promoting high energy-efficient products in Korea:

- A mandatory EE Labels and Standards Program for enhancing EE targeting 22 widespread and energy intensive products used in various sectors from domestic appliances to automobiles. Targeted products are rated from 5 to 1 and this EE label is attached to products. Production and sales of products that fall below the minimum energy performance standard are prohibited. All domestic manufacturers and importers must follow this program.
- A voluntary High Efficiency Appliance Certification Program for supporting the early stage market of 41 high efficiency products with specific targets on industrial products having low deployment rates but great EE potential.
- A voluntary e-Standby Program for reducing standby power of 20 products below 1 watt by 2010 (computers, TVs, etc.).

The promotion of these programs is ensured through public procurement services as well as mandatory use in public and specified buildings before being applied to the whole market. The High Efficiency Appliance Certification Program also offers rebates and tax deductions.

These three programs implemented in Korea have proven their effectiveness in saving energy. Many customers now prefer to buy energy-efficient products, which has encouraged manufacturers to develop energy saving technologies. The EE Labels and Standards Program has achieved successful accomplishments with domestic appliances. Refrigerators' energy consumption has decreased by 55% and air conditioners' EE has increased by 22%. Moreover, the dissemination of EE products has enabled the phasing out low energy-efficient products.

Improve Awareness Levels

Access to information is a fundamental component for developing a sustainable environment for EE implementation. Lack of information may impede an energy end-user from undertaking activities in EE and, unfortunately, it is one of the major barriers encountered in Egypt. Sporadic efforts have been made in the past along these lines, but have not been sustained. The EE project implemented by USAID in the 1980s and 1990s produced a wealth of excellent technical guidance notes, which seem no longer to be widely available. This may be a consequence of the rather fluid nature of the institutional responsibilities for EE in Egypt, which have not allowed any sustainable permanent centers of competence to emerge, accumulate knowledge, and deploy it effectively and in a sustained manner.

It is recommended that: a global initiative to increase awareness at all market levels in the country be implemented by the GOE.

¹⁰ The Korea Energy Management Corporation (KEMCO) Official website: www.kemco.or.kr.

Case Study: The UK Energy Efficiency Best Practice Programme¹¹

The UK Energy Efficiency Best Practice Programme (EEBPP) is an information dissemination programme that has successfully and cost-effectively addressed informational and technical market barriers. It was launched in 1989 to stimulate energy savings in industry, buildings and in the transport sector. The EEBPP set out to address the gap between what was currently achieved and what could be, with best practice, by promoting the technologies and the management practices. The Programme involved an integrated set of activities to develop and research current best practices, disseminate relevant and impartial information, and support the development of new energy efficient technologies and techniques. The Programme offered impartial information and advice, aimed at individual queries, tackling the seemingly conflicting barriers of too much information and insufficient unbiased information. Through promotion of results from successful demonstration projects, the Programme has stimulated senior management commitment and has overcome resistance arising from the perceived risk of investment in new technologies. To ensure sufficient programme coverage, the EEBPP comprised two components: industrial (including transport use) and buildings, and evolved working with the various business, commercial and public sectors.

The achievements of the Programme have been quantified after ten years of operation through independent studies. According to these studies, the EEBPP had stimulated energy savings in excess of GBP 650 million/year, equivalent to over 4 million tonnes/year of carbon savings. The EEBPP has clearly shown its effectiveness in generating energy savings, and has proven good programme management skills that allow it to identify and exploit energy-saving opportunities within and across the various industry and buildings sectors. Key to its success has been organizational learning and experimentation. Regular reviews of strategies ensured that Programme activities were continually refined and updated, and therefore remained appropriate.

Address Market Failures by Supporting the Development of Demonstration Projects and the Presence and the Capacity of Intermediaries

As there is no sustainable private sector based EE market in Egypt at this time, it is easy to conclude that market failures exist. There are certainly many and varied failures in Egypt that can be identified:

- Either as a consequence of the weak EE market in Egypt or as part of its cause, the lack of capacity at all levels in the market should be considered as one of the priorities of a global EE action plan for Egypt. Indeed, without the necessary capacity at the intermediary, financing institution, and end-user sides, it will be difficult to create a sustainable market.
- According to the RCREEE,¹² no research or demonstration projects in EE have been publically funded so far in the country. The absence of good demonstration projects means the awareness and risk perceptions barriers of end users in implementing EE project are not addressed. Supporting the implementation of such projects would address these common barriers and would support an initial increase of activities by intermediaries.
- There is an important need for the presence of a wide variety of intermediaries who can develop, propose, and implement EE solutions in Egypt. Intermediaries can take many forms, such as consulting engineers, equipment manufacturers and distributors, entrepreneurs, ESCOs, etc. Because there are a limited number of such intermediaries at this time in Egypt, and their size and capacities are too limited, it is currently impossible to count on them being the main triggers of the development of a market-based approach to EE in the country.

It is therefore recommended that:

¹¹ "Energy Efficiency Best Practice Programme Case Study", The Resource Saver Website:

www.resourcesaver.com/file/toolmanager/O105UF583.pdf

¹² RCREEE, "Economic, Technological and Environmental Impact Assessment of National Regulations and Incentives for Renewable Energy and Energy Efficiency: Country Report Egypt", September 2009, 130 pages.

- A national capacity building program be developed and implemented in Egypt in order to interest and develop enough experts to meet the human resources needed to implement and develop EE initiatives in the country. Such a program could focus on the training of maintenance and facility engineers about EE and energy management, and build the capacity of technical experts to perform audits, design and implement projects, or to develop projects within their own facilities, in the building or industrial sectors.
- A program should be developed to support the implementation of demonstration projects, in all sectors (residential, commercial, institutional and industrial) in order to create an initial market for intermediaries and to support the introduction of different technologies in the market
- Implement a national program to reduce energy consumption in public facilities. ESCOs, as an example of intermediaries, could be used by the GOE as effective intermediaries for the development and implementation of such projects. Even though the public sector market is seen as being very small compared to other markets, the development of such a program would create an instant market for these developing intermediaries, which will enable them to grow while developing other market activities that will take more time to mature. The program would also have the advantage of creating a higher level of awareness about the Energy Performance Contracting (EPC) concept, as high-visibility facilities, such as the Presidential Palace, military facilities, ministry buildings, schools, and hospitals, will benefit from these projects and will be widely publicized due to their national importance.

Case Study: Canada — The Green Technologies Demonstration Program¹³

The Province of Quebec, Canada, is one of the most recognized regions in the world for its leadership in the development of a sustainable EE market. Multiple incentive programs are offered to end-users. The *Agence de l'efficacité énergétique (AEE)*, EE agency, in order to pursue the objectives of the national green development strategies, has developed the Green Technologies Demonstration Program, to finance demonstration projects of innovative technologies and procedures having strong potential for reducing Greenhouse Gas emissions (GHG) in the province.

The program focuses on three different goals:

- Support the development of technologies limiting GHG emissions.
- Improve EE so as to reduce consumption of fossil fuels.
- Replace fuels and fossil fuels with renewable energy.

The program is provided with a budget of CAD 110M coming from the Green Fund; an annual duty imposed on distributors and businesses in the Quebec energy sector emitting GHG. Eligible projects must reduce GHG emissions focusing on sustainable development and the technologies in question must have strong market potential and an important demonstration effect on the market.

¹³ *Agence de l'efficacité énergétique* Official Website: www.aee.gouv.qc.ca

Case Study: United States — Federal Energy Management Program (FEMP)¹⁴

US Federal EE projects require funding to generate results, the U.S. Department of Energy (DOE) created the Federal Energy Management Program (FEMP) to support federal agencies in identifying, obtaining, and implementing alternative financings for EE projects in governmental facilities. Among these alternatives is EPC as practiced by ESCOs, which is a major vehicle to help federal agencies implement energy projects and achieve the established goals.

The FEMP is based on the following principles:

- Establishment, by DOE, of a FEMP EPC team providing technical assistance (TA) and facilitating the process for agencies entering EPC.
- Prequalification of ESCOs based on capability of managing the development and implementation of multiple EPC projects over a large geographic area and on the technical approach and price of a defined, site-specific project.
- Authorization for federal agencies to enter into EPC specifies that savings guarantees are mandatory and that Measurement and Verification (M&V) protocols will be used to verify that the guaranteed savings are achieved.
- Establishment, by FEMP, of an annual awards program recognizing federal agencies for outstanding projects that contribute significantly to meeting federal energy and water saving goals.

Over the past decade, approximately USD 2.3 billion of private sector funding has been invested in federal facilities, saving over 18 trillion Btu annually through more than 460 projects by fiscal 2007.

Use Utilities as Executing Agencies

Utilities can play an important role in the development of an EE market in a country. Even though it could be seen as counter nature for such organizations to promote EE, many specific cases can be found where the use of Demand Side Management (DSM) programs could be to their advantage. The improvement of the utilities' utilization factor, what is often called valley filling, could be done to their benefit. Even though some utilities have been promoting some EE activities in Egypt (Alexandria, North Cairo), not much has been done by utilities in Egypt to promote and implement EE in the country. Even though that it has been demonstrated, over and over, in many countries that utilities can be used in the context of an EE strategy as very efficient executing agencies to implement EE programs, the introduction of such a mechanism can become costly to them, both in terms of development and management, and in lost revenues. It has been common practice for governments to support such initiatives through either direct support from grants or through the application of specific mechanisms to finance them (approval of rate increases related to the loss of revenue). Different mechanisms can be developed to finance such initiatives, so they can be cost neutral for the government, the utilities and the end users.

It is therefore recommended that: the GOE supports the use of utilities as key actors in implementing EE initiatives in Egypt

¹⁴ Singh Jas [et al.], "Public Procurement of Energy Efficiency Services – Lessons from International Experience", The World Bank, Washington, 2010, pages 143 to 154.

Case Study: The Brazilian Public Benefit Wire-Charge Mechanism¹⁵

Since 1998, the regulatory agency requires Brazilian privatized electric distribution companies to pay a wire-charge corresponding to 1% of their annual revenues, which is primarily used by the distribution companies themselves. In 2000, generation and transmission companies also had to start contributing to the wire-charge program. The allocation of wire-charge revenues is under the responsibility of the regulatory agency, which also approves the project proposal of the distribution companies for the use of the funds. A portion of the EE allocation has to be dedicated to EE measures in low-income households.

In its initial phase, the program enabled distribution companies to assign up to 65% of the EE measures on the supply side, thereby reducing technical and commercial losses. In 2000, the legislation limited the application to end-use measures, such as energy-efficient motors in industries, HVAC systems in public and commercial buildings. All projects were initially implemented on a grant basis. Then, distribution companies were allowed to recuperate their EE expenditures using performance contracts with their customers, basically in public, commercial and industrial sectors.

The inflow of financial resources through the wire-charge program has created an important source of income for some intermediaries in Brazil, and had even become, for some of them, the main source of funding; thus assisting in addressing this barrier in the market. The distribution companies were targeting different types of projects and the intermediaries were competing for the design and the implementation. Some of the largest distribution companies in Brazil have increasingly outsourced EE projects to ESCOs, so that many have seen a considerable growth of their business during this period.

The wire-charge program implemented in Brazil has enabled the release of substantial funds to be partly dedicated to EE that would not have been available in a free privatized power sector without the enforcement of a regulator. In 2002, 117 EE projects were conducted under intermediaries' contracts, with investments totaling about BRL 23.5 million and 18.8% of energy savings. Although some analysts would say that the wire-charge program in Brazil was not optimal and has done little to transform the EE services market, the results accomplished within the ESCO industry were considerable.

Support the Introduction of an Adapted EE Financing Mechanism

One of the major barriers identified as a significant limitation to the implementation of EE projects is the absence of adapted financing mechanisms to enable interested private parties to implement financially viable projects. The huge success of a very small (almost symbolic) partial guarantee fund, the Egyptian Sustainable Loan Guarantee Mechanism (ESLGM), as developed three years ago under the UNDP/GEF EEIGGR project, demonstrated that such mechanisms could trigger an important leverage effect in the market, even if quite underdeveloped under that initiative because of its very small size.

It is therefore recommended that the GOE: supports the introduction of EE financing either through local FIs or through the development of a dedicated EE fund. Indeed, the presence of such a unique tool would serve many purposes including:

¹⁵ Robert P. Taylor [et al.], "Financing Energy Efficiency: Lessons from Brazil, China, India, and beyond", The World Bank, 2008, pages 235-242.

- To jump start activities that have all the necessary elements to be implemented, outside of the necessary financing.
- To serve as a demonstration initiative for many different projects that have not been undertaken so far in Egypt.
- To help introduce EE financing to FIs and to transform the market into a sustainable one.
- To leverage an existing demonstration initiative, the ESLGM, this was a tremendous success, but remained at such a small level that it had no impact on the market. However, it could have a great impact if it is increased in size.

Case Study: The Bulgarian Energy Efficiency Fund (BgEEF)¹⁶

The Bulgarian Energy Efficiency Fund (BgEEF) is a dedicated EE fund targeting the development and financing of commercially viable EE projects. Established by the government of Bulgaria in 2004, its objective is to support EE investments in Bulgaria by eliminating financing barriers through a self-sustaining, market-based financial instrument. Capitalized at about USD 15.4 million¹⁷, the BgEEF is a transparent mechanism that operates under the principle of a public-private partnership which means it is owned and supported by the Bulgarian government but structured as a self-sustainable independent legal entity. The Fund is managed by a private fund manager and offers three categories of financial instruments provided on commercial terms:

- **Loans** (end-users direct financing or co-financing with a commercial bank)
- **Partial credit guarantees** to share the risk with local FIs
- **ESCO Portfolio guarantees** to undertake some of the ESCO risks

After about five years of operation, the BgEEF represents a real success in the Bulgarian EE field, having been financially viable since its third year and having triggered a sustainable EE market in Bulgaria. Furthermore, the market transformation objectives of BgEEF were met, as many banks are now looking to either directly finance EE projects or co-finance them with BgEEF.

Set Priorities in the Sectors/technologies to be Addressed First

As the global EE potential is huge across all sectors in Egypt and features many barriers, the GOE will have to prioritize the initiatives it plans to launch in the market. A simple analysis of Egypt's energy profile clearly shows that the industrial sector is by far the most energy-consuming sector of the country, followed by residential and transport sector. Therefore, it seems natural to give a particular attention to EE in the industrial, residential and transport sectors. Focusing on specific technologies rather than specific sectors have also been used in many different countries with great effect as they are often broader in their potential scope and easier to manage.

It is therefore recommended that the GOE start focusing on three specific areas:

- In the industrial sector, start by focusing on cross sector initiatives that could be easier to design, manage and sell to decision makers in industries. In most countries where EE is well developed, industrial sector programs always include:
 - Benchmarking per industrial sectors so industries can be incentivized to improve their own EE.
 - A training program for energy manager so easy measures with short paybacks can be implemented at low cost/no cost.

¹⁶ BEEF Official Website: www.bgeef.com

¹⁷ Currency rate for 2005, January 1st : BGN 1 = USD 0.6970, www.economist.com

- A demonstration program for well-known technologies (efficient motors, chillers, boilers, etc), so this can eliminate many barriers in relation to awareness, knowledge and risk perception.
1. Start by focusing on a specific technology for all sectors, likely EE lighting, as it is one of the most cost effective initiatives in all market sectors. Such an initiative could be based on financial incentives, mandatory approaches (ban on the sales of incandescent lamps), or market driven approaches through the intermediation of utilities. This is indeed what the new upcoming UNDP/GEF initiative will be focusing on.
 2. In the transport sector, start introducing efficiency standards for new vehicles so in the short run, the global efficiency of all vehicles will be greatly improved through the normal replacement of current non efficient models.

Case Study: The Canadian Industry Program for Energy Conservation¹⁸

The Canadian Industry Program for Energy Conservation (CIPEC) is a voluntary partnership between the Government of Canada and the industrial sector that brings together industry associations and companies representing more than 98% of all industrial energy use in Canada. The CIPEC has been helping companies cut costs and increase profits by providing information and tools to improve EE such as:

- incentives for industrial energy retrofit projects,
- energy management workshops,
- employee Awareness Programs,
- energy Management Services Directory that helps companies locate contractors, as well as
- benchmarking information, case studies and technical guides.

Results achieved through the CIPEC since its implementation in 1975 are significant:

- The mining, manufacturing and construction sectors have voluntarily met and exceeded annual targets to reduce their energy intensity,
- Upstream oil and gas companies have implemented projects to reduce GHG emissions by millions of tonnes,
- Electrical utilities have dramatically increased their alternative energy production,
- And finally, over 5,000 industries reduced their combined energy intensity by 9.1% between 1990 and 2004.

Immediate Actions to be Taken

The development and implementation of an institutional, regulatory and policy framework to achieve sustainable energy efficiency over the long term require good planning, dedication and time. The following is a set of actions that are recommended for immediate implementation:

- Issue a strong policy statement to clarify the GOE's intention and commitment to energy efficiency so as to send a clear signal to society and the public.
- Designate an institutional champion to take stock of past and on-going energy efficiency activities and coordinate existing and future programs. The agency should be adequately staffed and funded.
- Based on the review, develop short-term and medium-term activities and programs to be implemented.

¹⁸ Natural Resources Canada Official website: www.nrcan.gc.ca.

- Clarify responsibilities for energy consumption data collection and analysis and develop a reliable energy consumption database.
- Allocate funding sources to support planned energy efficiency activities and programs.
- Prioritize activities by sector or business lines and jump-start low hanging-fruit opportunities.
- Focus initially on tapping high return activities in the industrial and public sectors.
- Develop commercial financing for energy efficiency improvement investment projects.

Proposed EE Activities for Donor Support

The GOE should seek and coordinate the use of potential EE funding from donors to support the development of institutional, regulatory and policy framework and the implementation of energy efficiency investment programs. The proposed EE activities to be carried out in the near to medium term which could be potentially supported by the donors are shown in Table 3.2. As the activities embody potentially wide scope of work, they could be supported by more than one donor that have interest in promoting EE activities and investment in Egypt.

Table 3.2: Proposed EE Activities for Donor Support

Activity	Description	Possible Source of Funding
Follow-up ESMAP TA	This activity will be a continuation of this study, aiming to assist the GOE in: (i) elaborating the institutional and regulatory options, and proposing an institutional structure adapted to the local context of Egypt to promote and implement EE; (ii) proposing a set of policies, financial incentives, and funding options and mechanisms aligned to the economic context of Egypt to encourage and support EE activities and investment; (iii) develop a priority EE investment program for implementation through assessing the energy saving potential and conducting cost-benefit analysis of EE projects in selected priority areas.	ESMAP
A GEF Operation	The objective of the GEF operation is to create the enabling institutional, regulatory, policy and financing environment to support and sustain energy efficiency activities and investment. The operation could include the following components: (i) establishment of a reliable energy consumption and efficiency data system; (ii) development of EE indicators for key sectors, processes and appliances; (iii) development of monitoring and evaluation framework for EE programs and activities; (iv) capacity building for government, suppliers, consumers and EE service providers; (v) creation of stable funding mechanisms to support EE; and (iv) implementation of demonstration projects	GEF
EE Investment	The objective of the project would be to help improve EE in	Multilateral

Project	selected priority areas with the best potential for scale up. The project could include: (i) a TA component to strengthen the institutional capacity to develop and sustain EE lending business, enhance the technical capacity of local financing institutions, and support the establishment of energy service companies (ESCOs); and (ii) an investment component to directly support the preparation and implementation of technically and financially viable EE investment priority projects.	and bilateral development agencies, commercial banks
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APPENDIX A: ENERGY INTENSITY

Energy intensity is a ratio of the amount of energy used per unit of economic output in dollars (or Egyptian pounds). It measures the overall efficiency of a country in using energy resources to create economic wealth. Although energy efficiency and energy intensity are sometimes used interchangeably, energy efficiency is more commonly used as a technical term to measure how efficient an industrial process or equipment is in converting energy or using energy to produce a specific product.

The energy intensity of a country's economy depends on many factors. First, a country's GDP is typically measured in the local currency, and then converted into US dollars according to official exchange rates. The official exchange rate puts heavy weight on tradable goods, while in low income countries the value of services and non-tradable goods are priced at much lower level. The fluctuation of the official exchange rate has a big impact on the size of a country's economy denominated in US dollars, and thus the energy intensity of a country's economy. For example, the US dollar has depreciated over 20 percent against other major currencies over the last two years. If measured in nominal term, the energy intensity of the US would have increased over 20 percent in comparison with other major countries. This is certainly not the case. In order to more accurately compare the size of economies valued in different currencies, the Purchase Power Parity (PPP) concept was introduced which aims to eliminate the effect of nominal foreign exchange. Table A1 provides a comparison of the energy used per unit GDP created in 10 selected countries in both nominal GDP and PPP.

Table A1 shows the large variations in energy used per unit GDP value created in different countries. If measured in nominal term, the Japan is 16 times more efficient than Russia, meaning that the Japan's energy intensity is only one-sixteenth of Russia's. However, if measured in PPP, the differences among the various countries narrow significantly. The UK becomes the most efficient country and Russia is still the most inefficient one. But the UK's energy intensity becomes about one-quarter of Russia's.

Table A1: Energy Use per Unit of GDP (toe/000 2000 USD)-2008

Country	Japan	UK	Germany	France	US	Egypt	S.Africa	India	China	Russia
Nominal GDP	0.10	0.12	0.16	0.18	0.19	0.49	0.73	0.75	0.81	1.6
Ratio	1.0	1.2	1.6	1.8	1.9	4.9	7.3	7.5	8.1	16
PPP	0.14	0.11	0.14	0.15	0.19	0.20	0.25	0.14	0.20	0.42
Ratio	1.27	1.0	1.27	1.36	1.73	1.82	2.27	1.27	1.82	3.82

Source: IEA

Table A1 indicates that even measured in PPP, one country could be nearly four times as efficient as another. The second most important factor that determines the energy intensity of a country's economy is the structure of the economy, e.g. the relative shares of industry and service sectors. Generally, 10 times or more energy is needed to generate the same amount of GDP in the industry sector as in the service sector. So the higher the percentage of the service sector is in GDP composition, the lower the energy intensity is. The reverse is also true, the higher the percentage of

the industry sector, the higher the energy intensity. Table A1 and Table A2 show that the top four least energy intensive countries all have 70 percent or more of GDP coming from the service sector.

The third factor affecting energy intensity is the structure of the country's industry sector, e.g. the composition of heavy industry, light industry, relative shares of raw material industry, processing industry, and high-tech industry. Typically several times more energy is required to produce the same amount of GDP in the construction material industry than in the high-tech industry. In general, the more developed country's industry focuses on the manufacturing of high tech products with high-added values, while the developing country's industry is more on producing raw materials and manufacturing low value-added labor intensive products. South Africa has a relative high share of service sector but high energy intensity. This could be partly due to its industry being heavily focused on mining and the associated processing business. Even in the same industry, developed countries normally only manufacture sophisticated high value-added goods. For example, even for steel production, developing countries produce more ordinary steel plate for construction needs, while developed countries produce stainless and other high quality steel for the needs of sophisticated equipment and instruments. A unit of the later consumers only 20 percent more energy than the former, but could be sold at prices 10 times higher. All these factors contribute to higher energy intensity in developing countries than in developed countries.

Table A2: GDP Share by Sector (%) - 2005

Country	UK	Germany	Japan	France	US	India	S.Africa	China	Russia	Egypt
Agriculture	1.0	1	1	2	1	19	3	13	6	14
Industry	26	29	31	22	22	27	31	46	38	39
Service	73	70	68	76	77	54	66	41	56	47

Source: World Development Report

The third most important factor affecting energy intensity is the efficiency of energy conversion and consumption by industrial processes, equipment and consumer products. It is typically measured by the energy consumed in producing a unit product or providing a unit service, like energy used in producing a ton of steel or gasoline consumed in driving 100 miles. The technical efficiency typically improves with the progress of technology. Again, limited by technical progress, energy efficiency for the same process or product is lower in developing countries than in developed countries. Technical progress generally moves with per capita GDP in a country (Table A3).

Table A3: GDP per Capita - 2008

Country	UK	Germany	Japan	France	US	India	S.Africa	China	Russia	Egypt
US\$	28,897	25,514	40,459	23,627	38,559	724	3,764	1,963	3,029	1,784
PPP	30,029	28,638	28,174	27,309	38,559	3,781	10,923	8,150	11,645	4,241

Source: World Development Report

The fourth important factor affecting energy intensity is the consumption behavior of consumers in a country, which is affected by weather conditions, geographical conditions and income status etc. The US has the highest share of service sector and the highest per capita GDP in PPP, but its energy intensity is more than 50 percent higher than those with similar economic structures even measured in

PPP. This surely is not because US has a more energy intensive industry structure or more energy intensive industry processes. This is primarily because of the excessive energy consumption in the residential and transportation sectors. People are used to large houses with constant temperatures all year round and like to travel around with large vehicles over long distances. Russia's high energy intensity is also partly due to the huge needs for heating because of extreme weather conditions. In developing countries, the energy consumption in the residential and transportation sector is still relatively small, but this could be the area driving future energy demand in developing countries.

Another factor affecting energy intensity is the structure of energy supply, e.g. the mix of energy sources. Generally, coal has much lower thermal conversion efficiency, either in the process of being converted into secondary energy or being consumed directly. For example, when converted into electricity, gas is 25% more efficient than coal and oil at the current stage of technology. Egypt has a relative high share of gas and has no coal in its energy mix (Figure A1). This should help reduce the energy intensity of its economy.

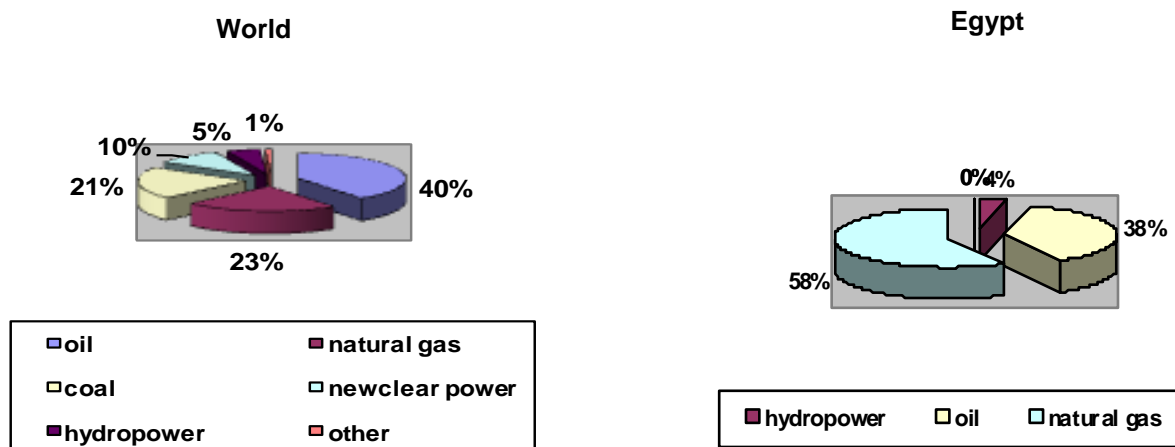


Figure A1: Egypt's Energy Mix as Compared with World Average

Appendix B: Past, Ongoing and Planned Activities

Over the past decades, the Government of Egypt committed itself to solve the growing problem of air pollution occurring in the country, which had signalled the beginning of EE initiatives in Egypt. Various international organizations have supported those initiatives. This Appendix summarizes the past, ongoing and planned donor support and initiatives in the EE field in Egypt based on the data collected from these organizations' official websites and information given by key stakeholders in the Egyptian market.

USAID---Energy Conservation and Environment Project (ECEP)

The USAID played a major role in promoting energy efficiency activities in Egypt over the period of 1989-1998. It was done through the Energy Conservation and Environment Project (ECEP). ECEP which was designed to:

- Promote and accelerate the adoption of improved commercial technologies, processes, and practices to increase energy efficiency
- Enhance Egyptian institutional capability to implement energy efficiency measures. The project demonstrated the application of proven energy- efficient technologies in order for both the public and private sector enterprises deal with potential plans for deregulating energy prices.

The project was executed through three implementing agencies; Development Research and Technological Planning Center (DRTPC) at Cairo University, Tabbin Institute for Metallurgical Studies (TIMS) and Federation for Egyptian Industries (FEI). The project consultants were Bechtel overseas and RCG/Hagler, Bailly, Inc. DRTPC was responsible to implement the project in the private sector, TIMS was responsible for the public sector and FEI was responsible for the training and data base. The project was primarily a technology demonstration project which set criteria for the beneficiary companies including: management commitment, the plant loading is not less than 60%, the project payback period is less than 5 years, the project investment cost should be higher than US\$ 50,000 and less than US\$ 1 Mil.

ECEP focused on ten proven energy efficient technologies: cogeneration, waste heat recovery, combustion control, power factor improvement, high efficient lighting, high efficient motors, energy management systems, process control, solid fuel boilers, and insulation and refractory. A large number of energy audits (over 200) were conducted and technical and financial feasibility studies were carried out before carrying on the implementations. Thirty demonstration projects in the area of energy efficiency were completed positively (15 at public sector industrial establishments and 15 in the private industrial and commercial sectors). The energy savings exceeded the 10% of the pre application consumption with simple pay back periods below the five years. Eighteen applications were conducted in the area of environmental protection. The fund for the energy efficiency component was 49.5 million US\$, while it was around 18 million US \$ for the environment applications.

In addition to the demonstration projects the project had a sounding training program; The project organized more than 120 training sessions where more than 4500 trainees have been trained. The program covered all the technologies adopted by the project as well as other engineering subjects

such as; project management. Feasibility studies, cost estimation, bid evaluation, financial analysis, planned maintenance and demand side management. Also, it issued 38 manual (see Appendix F); on energy efficiency and pollution protection were issued in Arabic and English. This is in the addition to a large number of technical briefs and reports representing the successful cases. Other topics such as energy business profile in Egypt, environment business profile, financing energy projects and local manufacturing of EE equipment manuals were also published.

USAID—Cairo Air Improvement Project

- Initiated in 1997 by USAID, in cooperation with the Government of Egypt and the EEAA.
- To reduce vehicular emissions (demonstration projects, training, public awareness campaigns, establishment of an air quality network, etc.).
- In 2000, 50 natural gas powered rolling buses were placed into commercial service in Greater Cairo.

USAID—The Egyptian Environmental Policy Program (EEPP)

- Started in 1999.
- Multi-year policy program to support policy, institutional, and regulatory reforms in the environmental sector.
- Aims to:
 - Implement a framework of environmental policy objectives and measures and market transformation initiatives.
 - Foster opportunities for Egypt's private sector and nongovernmental organizations to play a more active role in improving and protecting the environment.
- The Ministries of Environment, Petroleum, and Tourism were engaged in developing sustainable environment policies and institutional reforms.
- USAID assistance has already resulted, among other things, in:
 - The completion of the first Environmental Protection Fund (EPF) cycle and initiation of the second one, including the launch of a communication campaign strengthening EPF's outreach in the investment market.
 - The initiation of actions to develop a national EE strategy;
 - The creation of an environmental fund.

GEF/UNDP—Building Capacity for GHG Inventory and Action Plans

- Promotion of technical assistance and building of capacity in Egypt to respond to UNFCCC Communications Obligations through the enhancement of institutional networks, development of GHG inventory assessments, training of personnel, establishment of policy dialogues, evaluation of climate change mitigation initiatives, review of climate change impacts, and project proposal development.
- Approved in 1996.

GEF/UNDP—The Climate Change Capacity Building – Phase II

- Continuation of the GEF-UNDP Building Capacity in Priority Areas Project for institutionalizing climate change issues on a national level.

- Phase II focuses on assessing technology needs for adaptation measures for coastal zones, agriculture, and water resources.
- Approved in 2000.

The World Bank—National Strategy Study on Clean Development Mechanisms

- Assisted by the World Bank, with Swiss funding.
- Study for exploring opportunities and benefits through the adoption of Clean Development Mechanisms (CDMs).
- Started in October 2000 for a term of 1 year.

The Technology Cooperation Agreement Pilot Project (TCAPP)

The TCAPP was launched by three U.S. government agencies, including USAID, in late 1997 to help developing countries design and implement actions to attract investments in clean energy technologies and mitigate greenhouse gas emissions.

In Egypt, the TCAPP was launched in 1999 to provide a model for implementing technology transfer. The EEAA had the lead role in this effort focusing on specific areas, such as industrial energy efficiency measures and lighting efficiency technologies. This work will be undertaken in cooperation with the U.S. Country Studies Program to continue developing Egypt's Climate Change Action Plan.

The Global Environment Facility—GEF/UNDP and GEF/UNIDO Projects

The GEF has been supporting various initiatives in Egypt focusing on climate change and global environment concerns, mainly through UNDP. One of the major energy efficiency projects in Egypt was supported by the GEF through the UNDP.

Since 1999, the country has been profiting from a national project called the **Energy Efficiency Improvement and Greenhouse Gas Reduction Project (EEIGGR)**¹⁹, which consists of three different components: (i) loss reduction on the national grid and demand-side management, (ii) market support for energy efficiency businesses and energy codes and standards, and (iii) cogeneration. The EEIGGR has been implemented through the EEHC and the MOEE with the support of the UNDP as the GEF implementing agency and the United Nations Department for Economic and Social Affairs (UNDESA) as a cooperating agency.

The project's goal was to promote the energy service industry as a way of establishing a sustainable EE market in the Egyptian industrial and commercial sectors. The original plan was to finalize the project by 2003 within a 4-year time frame. Since then, the project was extended several times, at no additional cost, in order to complete the tasks requested in the project document as well as to ensure the sustainability of the mechanisms developed during the project. The EEIGGR project will be formally closed in June 2010.

Different activities have been conducted for the project execution.

¹⁹ The EEIGGR Information Center website, www.eeiggr.com.

Component 1—*Loss reduction, load management, and load shifting in the Egyptian Unified Power System of the EEHC*

- Reducing transmission losses of EEHC's Egyptian Unified Power System.
- Improvement of capabilities for transmission network loss reduction measurements.
- Setting up of priorities for dynamic responses of generating units.
- Network analysis and control strategies.
- Encouraging load shifting through time-of-use tariff.

Component 2—*Energy efficiency market support*

The energy efficiency industry supports:

- Promotion of the energy service industry through customer awareness, business transformation, and capital financing, including audits, business advice, and CFL leasing.
 - Achieved 200 energy audits in industrial, government, and commercial buildings between 1999 and 2003.
 - Implemented 20 projects resulting from the audits.
 - Supported the establishment of 8 ESCOs.
 - Trained 60 engineers in the field of energy audits.
 - Set up a leasing program for the diffusion of CFLs by electrical distribution companies.
 - Encouraged local manufactures to manufacture CFLs locally.
 - Initiated a public awareness program for the diffusion of efficient lamps.
- Support and capacity building provided to ESCOs through energy auditing training, energy-efficient technologies, economic and feasibility project evaluation, risk evaluation, and financing.
 - Developed simplified contracts for performance guarantees measurement and savings verification.
 - Issued an Egyptian measurements and verification protocol to verify energy savings in performance contracting.
 - EE measures implemented in the electrical distribution companies' administrative buildings and in the MOEE buildings.

EE standards and labels:

- Implementation of EE standard specifications for four classes of domestic appliances: refrigerators, washing machines, air conditioners, and electric water heaters.
 - Issued a ministerial decree to make the specifications and EE labels compulsory for local manufacturers and importers.
 - Created accredited EE testing laboratories (for appliances and CFLs).
 - Carried out training sessions on EE for manufacturers of domestic appliances.

EE codes for new buildings

- Development and application of EE codes for new buildings in residential, commercial and governmental sectors.

- Issued a ministerial decree from the MOH in 2005 for the enforcement of the EE code for residential buildings followed by the issuance of the EE building code for commercial facilities.
- Legislation is needed to ensure enforcement mechanisms for the adoption of EE building codes.

Energy Efficiency Center

- Creation an EE Center to promote awareness and strategic action on EE.
 - Assessed the EE potential in Egypt through the analysis of previous studies in this field.
 - Established a website in English (www.eeiggr.com) which should be followed by an Arabic version.
 - Established databases, including one presenting the energy consumption of governmental buildings for all distribution companies.

Component 3—*Cogeneration promotion*

- Establishment and training of a small power group within EEHC.
- Establishment of safety and interconnection requirements for parallel grid connections with small producers
- Developed industrial cogeneration and agricultural waste projects for small power production
- Creation and editing of a cogeneration guidebook.
- Preparation of a feasibility study for a cogeneration pilot project.
- Development of a cogeneration tariff.
- Establishment of a small power group with the EEHC.

Within **Component 2**, the EEIGGR adopted, among others, the Energy Performance Contracting (EPC) approach through ESCOs as a tool to provide energy efficiency know-how and to enable client financing.

In 2004, in response to the mid-term evaluation showing that ESCOs in Egypt were limited in their financing capacity and reluctant to take the risk of clients defaulting on payments, a new financing program was developed to enable the breakthrough of ESCOs in the Egyptian market and favor their access to adapted financing. The Egyptian Sustainable Loan Guarantee Mechanism (ESLGM) is a partial loan guarantee mechanism created to provide guarantees on loans to ESCOs for the implementation of energy efficiency projects in Egypt's commercial and industrial sectors.

Even if the EEIGGR Project has allocated only a small portion of the projects total budget for this loan guarantee mechanism (USD 280,000), it has been one of the most successful programs of the Project. Under the ESLGM, the number of guarantees provided was substantial, significant leverage was obtained, about 7 ESCOs were accredited and the loan guarantee mechanism is expected to continue to operate after the end of the Project.

According to the GEF project database²⁰, other projects with a specific focus on energy efficiency were recently approved by the Council. The **GEF/UNIDO Industrial Energy Efficiency Project** will have the main objective of facilitating EE improvements in the industrial sector (with a focus on SMEs)

²⁰ GEF project database, www.gefonline.org.

through supporting the development of a national energy management standard and EE services for Egyptian industries as well the creation of demonstration effects. According to the Project Identification Form, the project's main components and their expected outputs are described below.

- Development of a national energy management standard:
 - Policy instruments to stimulate EE improvements.
 - Structures for measurement and verification.
 - Energy management plan.
 - Industry certification of energy management standard.
- Stimulation of market demand for energy efficiency goods and services:
 - Information campaign.
 - National recognition program.
- Development of capacity building for EE services:
 - System optimization and energy management training sessions.
 - Business development consulting.
- Evaluation and suggestions for improving the financial incentive programs:
 - Financial assistance for industries adopting energy management plans.
 - Preparation of criteria for evaluating industrial EE projects.
- System optimization projects:
 - In-depth system assessment and implementation of optimization projects.
 - Dissemination of case studies and results to promote replication (workshops, publications, factory visits, and website).

As well, the **GEF/UNDP Project for improving the EE of lighting and building appliances** was approved in 2009 to improve the energy efficiency of end-use equipment. It is expected that it will promote market transformation of EE lighting, targeting the following end-user categories:

- Residential buildings.
- Government buildings.
- Commercial and private service sector buildings.
- Industry (in co-operation with the Industrial EE Project initiated by UNIDO).
- Street lighting.

According to the Project Identification Form, the project has three main components with specific expected outputs.

- Phasing-out inefficient lighting:
 - An enabling regulatory framework.
 - Innovative and attractive financing mechanisms.
 - Improving energy management of public buildings.
 - Marketing and public awareness campaigns.
 - Improving quality control systems.
 - Enhancing the capacity of local manufacturers.
- EE standards and labels for building appliances:
 - Monitoring and data collection studies.
 - Strengthening of the marketing and accessibility of appliances with standards and labels.

- Drafting of an EE standards and labels scheme for selected appliances.
- Upgrading of testing facilities.
- Monitoring and evaluation to sustain the project results.

The Industrial Modernization Centre (IMC)

In view of the government strategy to reduce energy use by 8.3% by 2022, the Industrial Modernization Centre (IMC)²¹ had set up the **Energy Efficiency and Environment Protection Programme** by the end of 2007 to improve the efficient use of energy and to encourage the use of renewable energy as a source of energy needs in industrial establishments. To do so, the IMC provides both technical and financial support to the industrial establishments by:

- Performing preliminary energy audits to identify:
 - Energy Savings potential through a number of proposed energy saving technology applications.
 - Technical and financial feasibility related to the proposed energy saving applications, which include:
 - Amount of energy saving and associated financial savings.
 - Estimated required investment.
 - Estimated payback period and return on investment.
 - Estimated amounts of pollutant reductions associated with the estimated energy savings.
- Support to identify and activate proper financing procedures to implement the recommended energy saving applications; either through IMC and/or other means such as Clean Development Mechanisms (CDM) or others.
- Financing provided by IMC (up to 15% of the EE application investment with a ceiling of EGP 150,000).
- Help to identify potential joint venture activities between national and international industries for the production of equipment with low specific energy consumption.

The Egypt Electricity Holding Company

EEHC has been promoting CFL as pilot programs, but on small scale since the 90's. More recently with electricity shortages (2007-2010) a scale up program has been initiated. The first phase of the program in 2009 distributed 6 million CFLs through distribution companies to low income households at half price (6 LE (approx 1\$)). The payments of the lamps were collected either in full or through installments added to the electricity bill. A second phase is underway with another 6 million CFLs following the same mechanism. Although the number of CFL distributed seems high, it is not clear whether the program has contributed to its goals or not, one of the reasons of that is that when CFL's are distributed old incandescent lamps are not collected or destroyed, second it is not certain whether the CFLs are installed in the appropriate locations where they are used the most, third no follow up analysis on the bills of the customers that have purchased the CFL's is made.

²¹ The IMC Official Website: www.imc-egypt.org

The Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)²²

Some programs and projects related to climate change and environmental protection implemented by GTZ are still ongoing in Egypt, and have an EE component.

The **Egyptian-German Joint Committee on Renewable Energy, Energy Efficiency and Environment (JCEE)²³** was established in 2007 by the governments of Egypt and Germany who saw in their similar priorities for EE and renewable energy development a potential for cooperation. The JCEE is a new form of a cooperation framework that offers a platform for energy policy discussion, for developing initiatives for investment as well as institutional projects, awareness and capacity building activities and establishing contacts and exchange between the two countries. It is planned that the organization will conduct the following activities in the field of energy efficiency until at least 2014:

- Clean Development Mechanism (CDM) in Egypt:
 - The JCEE is focusing on capacity building measures within the CDM Promotion Unit of the EEAA and the NREA especially in terms of identification, preparation and evaluation of CDM projects, with special attention given to the introduction of a Program of Activities (PoA).
 - European consultants contracted by JCEE conducted several training sessions and reviewed draft Project Idea Notes (PIN).
 - According to the JCEE Secretariat Director, Dr. Andreas Zoellner, efforts to register a PoA for replacing incandescent light bulbs by CFLs did not succeed due to the advanced implementation stage of ongoing activities financed by the MOEE and its subordinate entities.
 - Currently, the JCEE is assisting the MOEE in developing a PoA for a Street Lighting Program targeting various municipalities.
- Establishment of an EE Agency.
 - JCEE working group discussions lead to the elaboration of a concept paper for establishing an EE Agency in Egypt, which was presented to the Cabinet of the Prime Minister.
 - For a variety of political reasons, the GOE decided not to create a separate EE entity, but instead established an energy efficiency unit directly under the SCE meant to coordinate the efforts of various line ministries in the field of EE.
 - Since then JCEE has refrained from submitting institutional recommendations in this field.
- EE awareness campaign.
 - Under a public-private partnership approach, preparation of draft awareness raising material (partially animated TV spots, a documentary, radio features, mascot) for households including a comprehensive media plan in order to mobilize potential sponsors (CFL manufacturers, agents and distributors of home appliances).
 - A similar campaign targeting the industrial sector is currently being prepared by JCEE Private Sector Development Program (PSDP). The PSDP is promoting the certification of environmentally friendly and energy/resource efficient hotels (Green Star Initiative).
- Green Buildings.
 - Technical assistance in terms of integrating the topic of green construction and EE in buildings into the curricula of universities (Luxor, Alexandria and Cairo) as well as developing

²² The GTZ Official Website: www.gtz.de.

²³ The JCEE Official Website, www.jcee-eg.net

and implementing training modules for architects and engineers through the Egyptian German Chamber of Commerce and the HBRC.

- Supporting the elaboration of a green building code currently being developed by the Green Building Council.
- Providing technical assistance to EEAA in terms of the LEED design and certification process of the new building of the MOEE.

The GTZ is also providing technical assistance (TA) for the **Egyptian-German Private Sector Development Programme (PSDP)**²⁴. This program, implemented by the MTI, was established in 2005 to last until 2015 and has been, since July 2009, focusing on resource efficiency in the production processes of exporting industries but also in the hotel industry, which involves improving EE. EE is also being promoted in the area of impact measuring through preliminary energy audits and energy audit training courses which will start in November 2010. Furthermore, the PSDP has established a solar water heater network of Egyptian manufacturers and importers focusing on capacity building measures, quality improvement of products and installation and maintenance services. GTZ Egypt intends to elaborate a comprehensive framework for the promotion of solar water heaters before the end of 2010.

The GTZ is also supporting the **Regional Centre for Renewable Energies and Energy Efficiency (RCREEE)**²⁵ at the regional level. The RCREEE is an independent regional organization dedicated to promoting renewable energies and EE and provides a platform for exchanges on policy issues among countries of the Middle East and North Africa (MENA) region. The RCREEE was launched in 2008 (for an overall term of 5 years) with GTZ support in concert with the Danish International Development Agency (DANIDA), and the European Union. It is led by the Ministry of Electricity and Energy (MOEE) through the NREA.

Under this framework, the RCREEE:

- Promotes and provides training on energy audit programs in the building sector.
- Has initiated a policy discussion among its members about renewable energies and EE. Studies financed by DANIDA were published in 2009 to investigate questions such as the barriers to market entry by certain proven technologies and the EE national regulations and incentives situation for each region. The study published for Egypt was used as a reference for this mandate.
- Is currently working on regional standardization and certification procedures aiming at establishing a regional certification program for solar water heaters in the region to be implemented in cooperation with the League of Arab States in 2010.

The International Bank for Reconstruction and Development (IBRD) of the World Bank Group

In 2007, a credit line managed by the National Bank of Egypt was launched to finance the first component of the Second Pollution Abatement Project (SPAP). This component consists of an investment facility for pollution abatement, cleaner production and energy efficiency projects carried

²⁴ The PSDP Official Website, www.psdp-egypt.info

²⁵ The RCREEE Official Website, www.rcreee.org.

out by the Egyptian industrial sector. The financing was provided by a World Bank loan as well as concessionary loans from the AFD, the European Investment Bank (EIB) and the Japan Bank for International Cooperation (JBIC). This project should last until 2011.

The Agence Française de Développement (AFD)²⁶

The AFD (or French Development Agency) began its interventions in Egypt in 2005 which were materialized in 2007 with the opening of its Cairo Office.

The AFD has been co-financing the credit line created in 2007 under the Second Pollution Abatement Project (SPAP).

A project in the transport sector was launched in 2009. The AFD together with the GEF – UNDP will provide expertise and financial support to pilot projects targeting public transport improvement in Cairo. The project is expected to last 3 years. It will be implemented through the Ministry of Environment's executing agency, the Egyptian Environmental Affairs Agency.

The African Development Bank (AfDB)

On a multinational level, the AfDB is the lead executing agency for the Capacity Building for Regional Institutions Project in Africa²⁷. This three-year project (2009-2011) will enable the preparation of bankable projects in Africa by fostering capacity development. GTZ is also participating in the project to strengthen project planning and provide capacity building seminars on the energy sector.

The Japan International Cooperation Agency (JICA)

Since 2008 and for a 10-year operation duration, the JICA is supporting the Energy Control System Upgrading Project in Upper Egypt with the main objective of achieving stable and efficient electricity transmission and distribution in the South Region of Egypt by upgrading the existing Upper Egypt Regional Control Center (UERCC) and constructing the new Middle Egypt Regional Control Center (MERCC) and related equipment.

Also, the JICA is among the international donors for the credit line with the second phase of the Pollution Abatement Project.

Other initiatives

Last but not least, two regional projects based in Egypt and commissioned by the European Commission are currently being implemented by GTZ:

The Mediterranean Energy Market Integration Project (MEDEMIP)²⁸ – until December 2010 – proposes the following EE related activities:

- Supporting and initiating the elaboration of National EE Strategies in the Mediterranean.
- Preparing Budget Allocation Efficiency Charts.

²⁶ The AFD Official Website: www.afd.fr.

²⁷ <http://www.gtz.de/en/weltweit/afrika/28388.htm>

²⁸ The MEDEMIP Official Website: www.medemip.eu

The Mediterranean Energy Efficiency in the Construction Sector (MEDEDEC)²⁹ – until 2013 – focuses on capacity building and demonstration projects in the new construction sector.

The Deutsche Gesellschaft für Technische Zusammenarbeit³⁰

Some programs and projects related to climate change and environmental protection implemented by Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) are still ongoing in Egypt, and have an EE component.

The Egyptian-German Joint Committee on Renewable Energy, Energy Efficiency and Environmental Protection (JCEE)³¹ was established in 2007 by the governments of Egypt and Germany who saw in their similar priorities for EE and renewable energy development a potential for cooperation. The JCEE is a new form of a cooperation framework that offers a platform for energy policy discussion, developing initiatives for investment as well as institutional projects, awareness and capacity building activities, and establishing contacts and exchange between the two countries. Until 2014, it is planned that the organization will conduct the following activities in the field of EE:

- CDM in Egypt:
 - The JCEE is focusing on capacity building measures within the CDM Promotion Unit of the EEAA and the NREA especially in terms of identification, preparation, and evaluation of CDM projects, with special attention given to the introduction of the Program of Activities (PoA).
 - European consultants contracted by JCEE conducted several training sessions and reviewed the draft Project Idea Notes (PIN).
 - According to the JCEE secretariat director, Dr. Andreas Zoellner, efforts to register a PoA for replacing incandescent light bulbs by CFLs did not succeed due to the advanced implementation stage of ongoing activities financed by the Ministry of Electricity and Energy (MOEE) and its subordinate entities.
 - Currently, the JCEE is assisting the MOEE in developing a PoA for a street lighting program targeting various municipalities.
- Establishment of an EE agency
 - JCEE working group discussions lead to the elaboration of a concept paper for establishing an EE agency in Egypt, which was presented to the Cabinet of the Prime Minister.
 - For various political reasons, the GOE decided not to create a separate EE entity, but instead, to establish an EE unit directly under the SCE meant to coordinate the efforts of various line ministries in the field of EE.
 - Since then JCEE has refrained from submitting institutional recommendations in this field.
- EE awareness campaign
 - Under a public-private partnership approach, preparation of draft awareness raising material (such as partially animated TV spots, a documentary, radio features, and a mascot) for households including a comprehensive media plan in order to mobilize potential sponsors (CFL manufacturers and agents and distributors of home appliances).

²⁹ The MEDEDEC Official Website: www.med-enec.com

³⁰ The GTZ Official website: www.gtz.de.

³¹ The JCEE Official website: www.jcee-eg.net

- A similar campaign targeting the industrial sector is currently being prepared by JCEE Private Sector Development Program (PSDP). The PSDP is promoting the certification of environmentally friendly and energy/resource-efficient hotels (Green Star Initiative).
- Green buildings
 - TA in terms of integrating the topic of green construction and EE in buildings into the curricula of universities (Luxor, Alexandria, and Cairo) as well as developing and implementing training modules for architects and engineers through the Egyptian German Chamber of Commerce and the HBRC.
 - Supporting the elaboration of a green building code currently being developed by the Green Building Council.
 - Providing TA to EEAA in terms of the LEED design and certification process of the MOEE's new building.

The GTZ is also providing TA for the Egyptian-German PSDP³². This program, implemented by the MTI, was established in 2005 and will be ongoing until 2015. Since July 2009, it has been focusing on resource efficiency in the production processes of exporting industries and of the hotel industry, which involves improving EE. EE is also being promoted in the area of impact measuring through preliminary energy audits and energy audit training courses, which will start in November 2010. Furthermore, the PSDP has established a solar water heater network of Egyptian manufacturers and importers focusing on capacity building measures, quality improvement of products, and installation and maintenance services. GTZ Egypt intends to elaborate a comprehensive framework for the promotion of solar water heaters before the end of 2010.

The GTZ is also supporting the Regional Center for Renewable Energies and Energy Efficiency (RCREEE)³³ at the regional level. The RCREEE is an independent regional organization dedicated to promote renewable energies and EE and provides a platform for exchanges on policy issues among countries of the Middle East and North Africa (MENA) region. The RCREEE was set up in 2008 (for an overall term of 5 years) with GTZ support in concert with the Danish International Development Agency (DANIDA) and the European Union. It is led by the Ministry of Electricity and Energy through the NREA.

Under this framework, the RCREEE:

- Promotes and provides training on energy audit programs in the building sector.
- Has initiated a policy discussion among its members about renewable energies and EE. Studies financed by DANIDA were published in 2009 to investigate questions such as the barriers to market entry by certain proven technologies and the EE national regulations and incentives situation for each region. The study published for Egypt was used as a reference for this mandate.
- Is currently working on regional standardization and certification procedures aiming at establishing a regional certification program for solar water heaters in the region to be implemented in 2010 in cooperation with the League of Arab States.

³² The PSDP Official Website: www.psdp-egypt.info

³³ The RCREEE official website, www.rcreee.org.

The Agence Française de Développement³⁴

The AFD (French development agency) began its interventions in Egypt in 2005, which were materialized in 2007 with the opening of its Cairo office.

The AFD has been co-financing the credit line created in 2007 under the SPAP.

A project in the transport sector was launched in 2009. The AFD together with the GEF–UNDP will provide expertise and financial support to pilot projects targeting public transport improvement in Cairo. The project is expected to last three years. It will be implemented through the Ministry of Environment's executing agency and the Egyptian Environmental Affairs Agency.

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On a multinational level, the African Development Bank (AfDB) is the lead executing agency for the Capacity Building for Regional Institutions Project in Africa³⁵. This three-year project (2009-2011) will enable the preparation of bankable projects in Africa by fostering capacity development. The GTZ is also participating in the project to strengthen project planning and providing capacity building seminars on the energy sector.

The Japan International Cooperation Agency (JICA)

Since 2008, and for a 10-year operation duration, the JICA is supporting the Energy Control System Upgrading Project in Upper Egypt with the main objective of achieving stable and efficient electricity transmission and distribution in the southern part of Egypt by upgrading the existing Upper Egypt Regional Control Center (UERCC) and constructing the new Middle Egypt Regional Control Center (MERCC) and related equipment.

In addition, the JICA is among the international donors for the credit line with the SPAP.

Other Initiatives

Finally, two regional projects based in Egypt and commissioned by the European Commission are currently being implemented by GTZ.

The Euro-Mediterranean Energy Market Integration Project (MED-EMIP)³⁶—until December 2010—proposes the following EE related activities:

- Supporting and initiating the elaboration of national EE strategies in the Mediterranean
- Preparing Budget Allocation Efficiency Charts

The Mediterranean Energy Efficiency in the Construction Sector (MED-ENEC)³⁷—until 2013—focuses on capacity building and demonstration projects in the new construction sector.

³⁴ The AFD official website: www.afd.fr.

³⁵ <http://www.gtz.de/en/weltweit/afrika/28388.htm>

³⁶ The MED-EMIP official website: www.medemip.eu

³⁷ The MEDEDEC Official Website: www.med-enec.com

TABLE B1: MAJOR PAST AND ONGOING ENERGY EFFICIENCY INITIATIVES IN EGYPT

Project Name	Years	Donor	Total Amount	Executing Agency	Targeted Sector	Main Objectives	Results and Achievements
Industrial EE Project	Not started yet	GEF/UNIDO	GEF grant: USD 3,950,000 Co-financing: USD 15,675,000	MTI and EEAA	<ul style="list-style-type: none"> ▪ Industrial 	<ul style="list-style-type: none"> ▪ Development of a national energy management standard and EE services ▪ Improvement of financial incentive programs ▪ Demonstration of system optimization projects 	<ul style="list-style-type: none"> ▪ Under design at the UNIDO/GEF level
Project for Improving the EE of Lighting and Building Appliances	Not started yet	GEF/UNDP	GEF grant: USD 4,450,000 Co-financing: USD 13,200,000	MOEE	<ul style="list-style-type: none"> ▪ Residential ▪ Commercial ▪ Public ▪ Industrial 	<ul style="list-style-type: none"> ▪ Phasing-out of inefficient lighting ▪ EE standards and labels for building appliances 	<ul style="list-style-type: none"> ▪ Under design at the UNDP/GEF level
EE and Environment Protection Programme	2007-...	EU, GOE, and the Egyptian private sector	N/A	IMC	<ul style="list-style-type: none"> ▪ Industrial 	<ul style="list-style-type: none"> ▪ Conduct preliminary audits ▪ Provide financial support and subsidies 	<ul style="list-style-type: none"> • Ongoing
Energy Efficiency Improvement and Greenhouse Gas Reduction (EEIGGR)	1999-2010	GEF/UNDP	GEF grant: USD 4,110,000 Co-financing: N/A	EEHC and MOEE	<ul style="list-style-type: none"> ▪ Power ▪ Residential ▪ Commercial ▪ Public ▪ Industrial 	<ul style="list-style-type: none"> ▪ Loss reduction, load shifting, and load management in the unified power system ▪ EE market support (EE industry support, standards and labels, EE codes for new buildings, and EE center) ▪ Cogeneration 	<ul style="list-style-type: none"> ▪ Reduction of transmission losses ▪ Load shifting through time of use tariff ▪ 200 energy audits ▪ 20 EE projects ▪ Training sessions ▪ Creation of 8 ESCOs ▪ Successful transactions under the Loan Guarantee

Project Name	Years	Donor	Total Amount	Executing Agency	Targeted Sector	Main Objectives	Results and Achievements
						<ul style="list-style-type: none"> promotion ▪ ESCO development support ▪ Small partial loan guarantee mechanism 	<ul style="list-style-type: none"> Mechanism ▪ Application of a leasing program for the diffusion of CFLs by electrical distribution companies ▪ Standards and labels for domestic appliances ▪ Testing laboratories ▪ EE building codes ▪ EE Information Centre
Climate Change Capacity Building – Phase II (continuation of the GEF/UNDP Capacity Building Project)	2000- N/A	GEF/UNDP	GEF grant: USD 48,000 Co-financing: 0	GOE	▪ Building	<ul style="list-style-type: none"> ▪ Institutionalization of climate change issues on a national level ▪ Assessment of technology needs 	▪ N/A
National Strategy Study on CDM	2000-2002	World Bank (with Swiss funding)	N/A	EEAA	▪ Power	<ul style="list-style-type: none"> ▪ Study to develop opportunities presented by potential international markets for GHG offsets through the CDM of the Kyoto Protocol 	<ul style="list-style-type: none"> ▪ The publication of the study in 2003
EE and Pollution Prevention Project (E2P2) ³⁸	1999-2003	N/A	N/A	N/A	▪ N/A	▪ N/A	▪ N/A

³⁸ EgyptERA, “Status of Energy Efficiency in Egypt and Its Regulatory Framework”, presentation by Dr. El-Salmawy.

Project Name	Years	Donor	Total Amount	Executing Agency	Targeted Sector	Main Objectives	Results and Achievements
Egyptian Environment Policy Program (EPPP)	1999- N/A	USAID	USD 170 million (including 60 million of TA)	N/A	▪ Policy	▪ Implementation of policy reforms in the environmental sector and market transformation initiatives	▪ The creation of an environment fund ▪ The initiation of actions to develop a national EE strategy
Technology Cooperation Agreement Pilot Project	1999- N/A	USAID	N/A	EEAA	▪ Industrial	▪ Introduction of a model for implementing technology transfer	▪ N/A
Cairo Air Improvement Project	1997- 2000	USAID	USD 60 million	EEAA	▪ Transport	▪ Reduction of vehicular emissions through demonstration projects, training, awareness campaigns and an air quality network	▪ 50 natural gas powered busses in service
Building Capacity for GHG Inventory and Action Plans in Response to UNFCCC Communications Obligations	1996- N/A	GEF/UNDP	GEF grant: USD 402,000 Co-financing: 0	EEAA	▪ Building	▪ Promotion of TA and build capacity to respond to the FCCC	▪ N/A
Energy Conservation and Environment Project (ECEP)	1989- 1998	USAID	N/A	N/A	▪ Power	▪ Demonstration of the technical and economic feasibility of EE projects through pilot projects	▪ Cogeneration, fuel switching and waste heat recovery demonstration projects

Donor	Policy	Residential Sector	Commercial Building Sector	Public Sector	Industrial Sector	Transport Sector	Power Sector
AFD						<ul style="list-style-type: none"> Pilot projects improving public transport 	
AfDB				<ul style="list-style-type: none"> Capacity building for regional institutions 			
DANIDA	<ul style="list-style-type: none"> Study on EE regulations and incentives 						
GTZ	<ul style="list-style-type: none"> EE awareness campaigns Establishment of an EE agency Policy discussions about EE 	<ul style="list-style-type: none"> Regional certification for solar water heaters 	<ul style="list-style-type: none"> TA for developing green buildings Training on energy audit programs 		<ul style="list-style-type: none"> Energy audit training sessions and preliminary energy audits 		<ul style="list-style-type: none"> CDM
UNDP	<ul style="list-style-type: none"> Creation of an EE center EE policy 	<ul style="list-style-type: none"> EE code Standards and labels for domestic appliances EE lighting 	<ul style="list-style-type: none"> EE building code EE lighting 	<ul style="list-style-type: none"> EE lighting for buildings Street lighting 	<ul style="list-style-type: none"> Energy audits and ESCOs Efficient lighting initiatives Loan guarantee scheme for ESCOs EE lighting 		<ul style="list-style-type: none"> Loss reduction, load shifting, and load management Cogeneration promotion
UNIDO					<ul style="list-style-type: none"> National energy management standards for SMEs EE services for SMEs 		