

Energy Efficiency Situation through Energy Efficiency GEF/UNDP project

Dr. Ibrahim Yassin Mahmoud
Project Technical Director





Energy Efficiency Improvement
& Greenhouse Gas Reduction
Project

The national strategy for the Egyptian power sector includes among others the following:

- Optimize use of available energy sources and minimize environment pollution.
- Provide electricity with minimum price and best quality.
- Restructure electricity sector to optimize investments and improve electrical services.
- Utilize modern and sophisticated technical systems in electricity sector's operation and activities.
- Develop the expertise and skills of engineers and technicians working in the electricity sector.
- Energy Efficiency Improvement.

Energy efficiency represents the most cost-effective option to reduce potential supply shortages, improve energy security, and mitigate local and global environmental impacts, without compromising economic development.



Energy Efficiency Improvement
& Greenhouse Gas Reduction
Project

Energy Efficiency Improvement and Greenhouse Gas Reduction Project

- Within this strategy, the Ministry of Electricity and Energy has since 1999 started implementing one of its most important projects: ” **Energy Efficiency Improvement and Greenhouse Gas Reduction**”, jointly financed by the Global Environment Facility (GEF), the United Nations Development Program (UNDP), and the Government of Egypt, and executed by the Egyptian Electricity Holding Company (EEHC), Ministry of Electricity and Energy (MOEE). This project phase ended in year 2010.

*This project was to assist Egypt in reducing the long term growth of GHG emission from electric power generation and consumption of non-renewable fuel resources.
The project had three main components:*

- 1- Loss reduction, load management of the Unified Power System (UPS) of EEHC and encourage load shifting through time-of-use (TOU) tariff.
- 2- Energy efficiency (EE) market support.
- 3- Promotion of Cogeneration.



Energy Efficiency Improvement
& Greenhouse Gas Reduction
Project

Main Achievement of the Energy Efficiency and Greenhouse Gas Reduction Project (Phase I)

1. **Loss reduction, load shifting and load management** of the Unified Power System (UPS) of EEHC.
 - **Calibration** of all measuring devices and set up a program for periodical calibration of equipment.
 - **Assessment** of dynamic response of generating units (37 units- 10 000MW) based on original specifications and take mitigation actions to improve their performance.
 - **Tuning** of 24 units to work under Automatic Generation Control (AGC).
 - **Improving** power factor by installing capacitor banks, maximizing use of reactive power by generators and optimization of network planning).
 - **A time-of-use** (TOU) tariff structure has been proposed; the government has approved the TOU tariff which has been applied first to the heavy consuming industries 50% higher during peak hours (4hours) .
 - **Decrease** % energy losses from 6% in 1999 to 3.76% in 2010 achieving a reduction of 4.73 MTOE and 13.8 MT of CO₂.

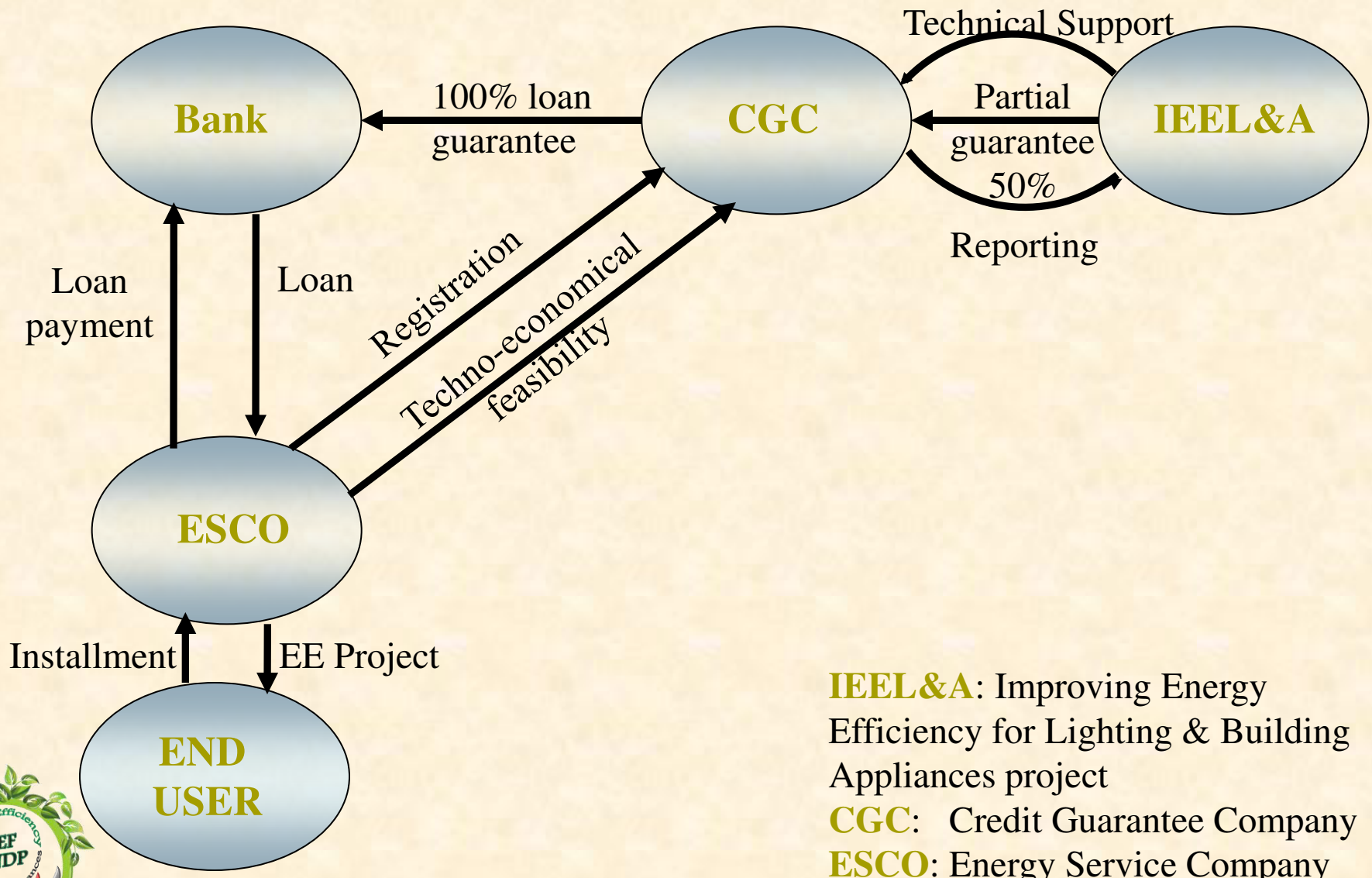
Main Achievement of the Energy Efficiency and Greenhouse Gas Reduction Project (Phase I)

2) Energy Efficiency Market support

- **Develop** a loan guarantee mechanism to support ESCOs development and assist them in implementing energy efficiency projects in different sectors. Loan guarantee mechanism implemented with Credit Guarantee Company (47 projects are implemented at a total cost of EGP 30 million and a guarantee of EGP 19.5 million).
- **Training** of energy auditors and conduct more than 400 audits in different sectors (industrial commercial , administrative....).
- **Development** of energy efficiency standards and labels for 5 electrical appliances: **Refrigerators/freezers, washing machines, air conditioners, efficient lighting equipment and electrical water heaters**, Ministerial decrees for the enforcement have been issued . Accredited performance testing laboratories have been established at the Egyptian Renewable Energy Testing & Certification Center.
- **Development** of an **energy efficiency building code** for new residential, commercial and administrative buildings and Ministerial decrees have been issued for enforcement.



Loan Guarantee Mechanism



IEEL&A: Improving Energy Efficiency for Lighting & Building Appliances project

CGC: Credit Guarantee Company

ESCO: Energy Service Company





Energy Efficiency Improvement
& Greenhouse Gas Reduction
Project

Main Achievement of the Energy Efficiency and Greenhouse Gas Reduction Project (Phase I)

3) Promotion of Cogeneration

- Establish and train a small power group within EEHC.
- Establish safety and interconnection requirements for parallel grid connections with small producers.
- Develop industrial cogeneration and agricultural waste projects for small power production.
- Parallel operation of the previous co generation project implemented since 1993 in an Aluminium company (Alu Misr) to add a 525kW generating unit to feed some of the company loads through two transformers. For technical reasons, the unit could not be loaded more than only 300 kW ie 57% of its full capacity.

The parallel operation of the unit with the electricity grid increased its efficiency where the unit has been loaded to up to 470 kW i.e 90% of its capacity, moreover the amount of steam has been increased by 1 ton i.e by 33%.

Supreme Energy Council's Decision

The Supreme Council of Energy has taken a decision to develop energy efficiency programs to be applied on National Basis in the following sectors:

- Residential Sector.
- Street Lighting.
- Governmental Buildings.

Moreover the development of the National Energy Efficiency Action Plan (NEAP) 2013-2015 has also involved these sectors.

Promotion of Efficient Lighting

- Lighting is the largest electricity user in different sectors of consumption, it accounts for 25 % of the total energy sold in the country.
- The residential and commercial sectors consumes nearly 34% of their energy - estimated at 43% of the total energy for lighting purposes, the lighting consumed by the industrial sector accounts for 10%, while the public lighting and government buildings lighting accounts for nearly 7% .
 - Lighting in Egypt is responsible for the system peak time electricity production; in addition to high electricity bills, it has a negative impact on the environment by requiring the combustion of greater quantity of fuel in power plants.

Efficient Lighting Initiatives undertaken by the Power Sector in the Residential Sector:

- **Undertake** a program for the diffusion of CFLs by the Distribution Companies through leasing programs, with a subsidy of 50% of normal retail price of good quality CFLs:

11.2 million lamps 20 watt have been sold to customers with half of their price 6 L.E and a guarantee period of 18 months.

- **Encourage** the private sector to locally manufacture high efficient lighting equipment (CFLS and Electronic ballasts).
- **Awareness** programs for the diffusion of efficient lighting equipment through media, seminars and exhibitions and cooperation with NGOs.

Program Achievement:

- **Increase** the sale of CFLs from 0.28 million lamps in year 2000 to 17 million lamps by 2010 and decrease the price from 50 L.E to 12 L.E.
- **Achieved savings from this CFL Program and other lighting initiatives: 6.8 MTOE and 14.8 MT of CO₂.**

Market survey showed that CFLs market number reached 26 Million lamps in 2012

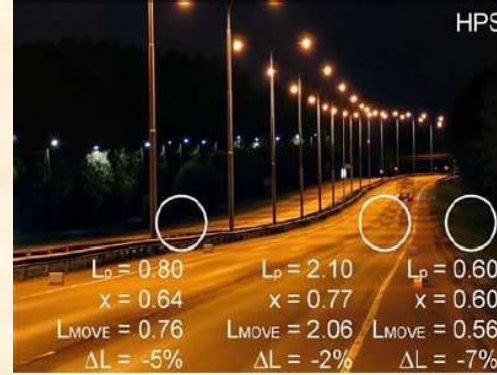
Street Lighting

- Street lighting consumption in Egypt represents 6% of the total consumption costing 2.7 billion L.E
- Street light commonly uses 400, 250, watts sodium lamps, 250 watts mercury vapor lamps, and 200,150,100 watts incandescent lamps. These lamps are mounted on poles with height ranging from 13 to 6 meters.
- According to a survey, the estimated number of different types of used lamps in (million) is :
 - 400 watts sodium 0.825
 - 250 watts sodium 2.252
 - 200 Watt incandescent lamps 0.785
 - 150 watts incandescent lamps 0.369
 - 100 watts incandescent lamps 0.863

Energy Efficiency Initiatives in Street Lighting

- A program for increasing energy efficiency of street lighting is currently implemented in cooperation between the Ministry of Electricity and Energy and the Ministry of Local Development and funded through the Ministry of Finance with an amount of million L.E. 260.
- According to the implementation plan :
 - The 400 watt sodium will be replaced by 250 high pressure sodium lamp.
 - The 250 watt sodium will be replaced by 150-100 watt high pressure sodium lamp according to type of street.
 - The incandescent (200-150-100 watt) lamps will be replaced by CFLs with lower wattages.

26 July Street, Zamalek, High Efficiency Lighting Pilot Project



26 July Street, Zamalek, High Efficiency Lighting Pilot Project

Before



After



Energy Efficiency Initiatives in Governmental Buildings

- Egyptian Governmental Buildings (EGBs) represent a high share of electricity consumption, about 5.5% of the total electricity consumption,
- **A study has been undertaken to recommend energy efficiency improvement measures to be taken in these buildings:**
 - **Short term recommendations:**

Appointment of an energy manager for each governmental building in addition to awareness programs
 - **Medium term recommendations :**

Implementing retrofits of the current governmental building facilities especially for the lighting system, in addition of improving power factor for these buildings.
 - **Long term recommendations:**

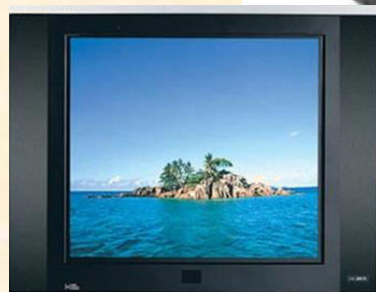
Developing governmental procurement guidelines to take into consideration energy efficiency concept. This stage will rely on the results and experience gained from the medium term recommendations.

Energy Efficiency Initiatives in Governmental Buildings

- An Energy Efficiency building code has been developed for the administrative buildings and a Ministerial decree has been issued for enforcement.
- The Ministry of Electricity and Energy has taken the initiative of starting by its own administrative buildings.
- The Electricity Distribution Companies set a program for implementing energy efficiency measures in their administrative buildings.
- The Electricity Distribution Companies set a program for implementing energy efficiency measures in customers administrative buildings in their respective geographical areas.
- Energy efficiency lighting systems projects have been implemented in some governmental buildings belonging to the Ministry of Water Resources and Irrigation, the Cabinet of Ministers, the Ministry of Communication and Information Technology.



Improving Energy Efficiency for Lighting & Building Appliances





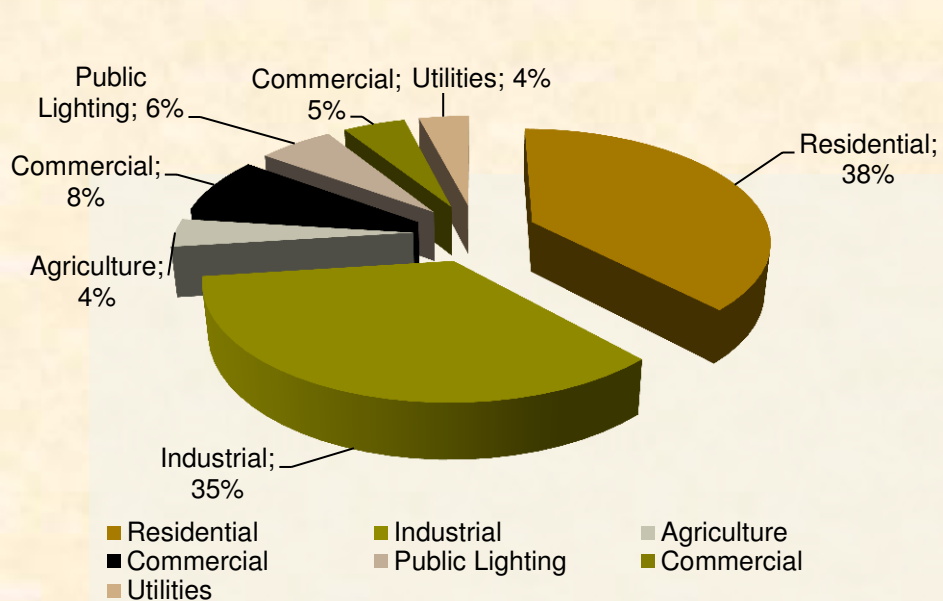
Improving Energy Efficiency of Lighting and Building Appliances Project

- Building on the success of the implemented Energy Efficiency Improvement and Greenhouse Gas Reduction project, GEF has decided to expand its activities for a second phase and has allocated an amount of US\$ 4,450,000 for its implementation.
- The main objective of the second phase is to achieve a complete market transformation towards the use of energy efficient end-use equipment, namely building appliances and lighting systems manufactured, marketed and used in Egypt.
- The project is implemented by the Ministry of Electricity and Energy and the Egyptian Electricity Holding Company.
- The project started January 2011 for a duration of 5 years

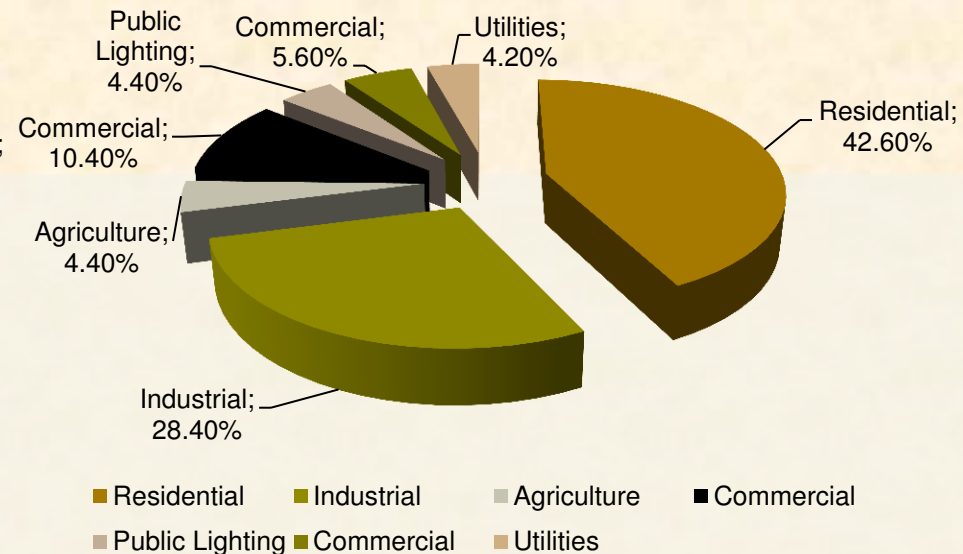
Electricity Consumption By sector

2007/2008

2012/2013



Total consumption 106.6 T.W.h.



Total consumption 140 T.W.h.



Improving Energy Efficiency of Lighting and Building Appliances Project

The project objective will be achieved through the following:

- Support the Government of Egypt in strengthening the legal and/or regulatory framework for promoting energy efficient products lighting and household appliances.
- Develop monitoring and enforcement mechanisms.
- Building consumers' confidence on the quality and cost saving opportunities of energy efficient lighting and household electrical appliances.
- Ensuring that the performance and quality of these products can meet consumers' expectations.
- Continuing the development of attractive financing schemes to overcome the identified financing barriers.
- Increase awareness, capacity building and provide training to public authorities and other relevant stakeholders.



Improving Energy Efficiency of Lighting and Building Appliances Project:

The project will be achieved through three main components:

- Accelerated growth of the EE lighting market in Egypt.
- A comprehensive S&L scheme for building appliances developed and effectively implemented, matching international and regional best policy and technology practices.
- Sustainability of project results.

Outcome 1: Accelerate growth of the EE lighting market in Egypt

Target: Gradually phase-out the most inefficient lighting products by 2020 through making energy efficient lighting products first choice for residential, commercial and administrative buildings, as well as street lighting



Achievements:

- **Updating** the EE specifications for efficient lighting products in cooperation with the Egyptian Organization for Standards (EOS) and in compliance with International Standards and unification of these standards at the national level, this includes different types of indoor and outdoor lighting as well as street lighting.
- **Sending** a circular from the Ministry of Electricity and Energy to all government agencies and municipalities to adopt the Minimum Energy Performance Standard (MEPS) for lighting systems in any tender documents issued for lighting systems procurement.
- **Issuing** a Ministerial Decree to prevent the import of General Lighting Service (GLS) lamps (i.e. incandescent lamps) with a wattage greater than 40 watts.



➤ **Issuing a Ministerial decree** to enforce the previous ministerial decrees for strictly adopting MEPS of lighting equipment by importers and manufacturers defining the penalties of non compliance.

➤ **Providing** capacity building and training workshops in the field of lighting auditing to managers of public buildings and municipalities in cooperation with the EU-funded MED-ENEC project. The training was attended by 47 trainees representing different ministries, local authorities and consulting firms.

➤ **Training** engineers from the 9 electricity distribution companies (10 staff from each company) for conducting energy efficiency lighting audits in buildings and preparing auditing reports, including techno-economic feasibility analysis.



- **Providing** technical assistance for transformation of non efficient lighting systems by efficient ones in 7 government, recommendations were for the replacement of magnetic ballasts by electronic ones and GLS by CFLs.
- **Improving** public procurement process through preparation of a **simplified guidebook** including the steps to be followed when procuring efficient lighting equipment, a guidance note for the replacement of each type of lighting equipment by the respective efficient one, the testing requirements and the issued specifications for each type of efficient lighting for public buildings (inside and outside) as well as street lighting.
- **Organizing** several awareness seminars in cooperation with the National Council of Women, EEU, Ministry of Housing, GIZ etc.



- **Implementing** an energy conservation initiative - in collaboration with the Energy Efficiency Unit (EEU) in the Cabinet of Ministers and GIZ,-targeting mosques that started with energy audits in 210 mosques. The results of the audits were used in the preparation of an energy efficiency guide for improving energy efficiency in lighting systems and air conditioning systems in mosques. The guide was circulated to all mosques in the country.
- **Conducting** 5 training courses for 150, from Electricity Distribution Companies and 24 governorates in “**Street lighting building code**” in cooperation with “Building and Research Center”.
- **Conducting** new training courses for introducing LED lamps technologies.



- **Replication** of EE lighting systems in governmental buildings based on results of the provided technical and financial assistance for transformation of lighting systems in 7 government buildings belonging to:
 - a. Ministry of Water Resources and Irrigation (Three buildings),
 - b. Cabinet of Ministers (Three Buildings).
 - c. Ministry of Communication and Information Technology
- **Through** the fund provided by the MDGF Joint Programme on Climate Change as an incentive for replication of these measures in other buildings, the developed financing mechanism as well as the ACRI is implement EE pilot projects in the administrative buildings with a 50% co-funding and 25% co-funding for the private sector, the requesting party will secure the remaining funding, this is achieved through a memorandum of understanding signed between the **Ministry of Electricity & Energy** and the Ministries or private sectors requesting to benefit from this mechanism through selection one of their buildings.



- **Pilot projects** for the transformation of the lighting systems in public and private sector buildings to efficient ones to be replicated on a larger scale:
- Conducting energy efficiency lighting audits in more than 30 buildings including governmental buildings, banks, shops, hotels, schools, hospitals, mosques, sporting clubs, residential compounds.
 - Up till now 5 projects have been fully implemented, 5 are under implementation, another 5 are starting tendering process.
 - Some of these projects are complemented by photovoltaic projects through a memorandum of understanding signed with the Energy Efficiency Unit of the Information and Decision Support Center.
 - For the implemented projects, case studies findings report and informative brochures are now under preparation to stimulate replication of such type of projects.
- **Introduce** the LED lamping technology to be used for indoor and outdoor purposes based on the international standards specifications.



Transfer into LED project

One of the CIB branches

before

after



➤ Street Lighting

- Hiring street lighting local consultation firm to evaluate the existing situation of the street lighting improvement project and to give recommendation to the Egyptian Government mechanisms to improving street lighting efficiency aiming to gradually phase-out all inefficient street lighting by 2020. The recommendations should be based on an assessment of the existing situation and implementation progress of the street lighting programme, and analysis of the associated barriers.
- A street lighting study is undergoing aiming at evaluation of the existing street lighting situation and the different barriers facing implementation of street lighting energy improvement program that has been initiated since 2010 but for some reasons is not well achieved: recommendations of this study will be discussed with the concerned high level authorities on how to face these barriers preliminary recommendations have been presented to the Prime Minister through the Minister of Electricity and Renewable Energy.



- The Energy Efficient street lighting code has been introduced to engineers from the municipalities being responsible of street lighting design and implementation.
- Another study will start for the conceptual design of a street lighting LED/Photovoltaic System with the required tendering documents (An initiative adopted by the Ministry of Housing and Urban Communities in response to Cabinet decision).
- A circular has been sent from the Ministry of Electricity and Renewable Energy to Ministry of Local Development to assign an Energy Efficiency unit and a focal point in each governorate to follow up all issues related to energy efficiency in buildings and street lighting

Outcome 2:

Comprehensive S& L Scheme for Building Appliances Developed and Effectively Implemented

Target: Strengthen the implementation, regular updating and enforcement of the S&L and expand the EE S&L schemes to other appliances



Monitoring for end use sales in residential & commercial sectors

Strengthening compliance checking for products that adopted S& L schemes

Establish mechanism for enforcing S & L Schemes

Expand mandatory EE S&L for new appliances

Upgrade the testing facilities

Develop promotional campaigns

Train sales staff in retail stores to market the products on EE bases

Barriers:

- Testing is obligatory for imported products only, leaving the domestic production free of any legal obligations.
- No market monitoring/inspection of retail stores
- Enforcement mechanism need to be strengthened.
- Lack of consumer confidence in the S&L scheme.

Achievements:

- **Developing** Minimum Energy Performance Standards (MEPS) for fans and dishwashers based on international experience, the work is finished.
- **Developing** MEPS for Televisions, Electric Ovens, Water Pumps and Air-conditioning with inverter compressors the work ongoing.
- **Studying** MEPS for Space Heaters, Electric Motors and Hermetic Compressors, the work in pipeline.
- **Issuing** the Request for Proposal (RFP) of Energy Efficiency Testing Laboratories for Dishwashers and Electric Fans.
- **Preparing** the Request for Proposal (RFP) of Energy Efficiency Testing Laboratories for Water Pumps, Electric Motors and Hermetic Compressors.



- **Issuing** a modified ministerial decree (2011) for enforcing the S&L programme developed under phase 1 of the project in order to face barriers preventing full implementation of the previous issued ministerial decrees 2003 and 2005.
The new Ministerial decree is defining the assigned responsibilities of each stakeholder involved in the programme and the penalties to be applied in case of non-compliance
- **Increase** the efficiency of air conditioners through raising the minimum set point for AC to 20 instead of 16 degrees Celsius; a Ministerial decree for enforcement was issued 2014.



- **Coordinating** with EOS and manufacturers of air conditioners to discuss the option of reducing consumption of air conditioners by making it compulsory for all AC units entering the Egyptian market to have inverter compressor technology. Additionally, discussions are underway to mitigate the cost of this inverter compressor technology through a reduction in customs duties.
- **Capacity building** of manufacturers , retailers and NGOs to increase their awareness of EE label information in order to assist buyers in selecting the most efficient electric household appliances.
- **Public Awareness** Establishing a huge national awareness campaign in Greater Cairo where more than 100 young students have been trained to increase public awareness for energy conservation and energy efficiency improvement.





- **Completed** a study is to develop a monitoring system for lighting systems and electric home appliances through the establishment of a mechanism for monitoring the annual sales and electricity consumption of lighting systems and targeted home appliances and to strengthen the implementation, enforcement and monitoring of the S&L programme for efficient home appliances developed earlier during phase 1 of the project, in addition to developing a model for calculation of GHG savings.
- **Starting** a study to develop an energy consumption pattern of home appliances in Egypt.
- **Establishing** a control system for EE standards and labels in Egypt market with partnership of EOS (Egyptian Organization for Standardization) and CPA (Consumer Protection Agency).

Outcome 3:

Sustain project results



Target: promotes the sustainability and replication of the project results as well as adaptive management by ensuring that proper feedback mechanisms are in place

Update baseline study to measure the impact of the project

Establish a market monitoring system for assessing the impact of the project to provide bases for identifying new energy saving opportunities

Elaborate and leverage the applicable financial support mechanism to continue the implementation of EE investments

Barriers:

- Difficulties in obtaining data on the sales of efficient lighting systems and efficient household appliances and their impact on market transformation and energy savings.



Recycling of the CFL components and materials

- Limiting the mercury content of the lamps is an important point of discussion EU standards[could be applied (the current European limit is a maximum of 3 mg of mercury per lamp).
- Waste management and recycling of the components and/or materials of the lamps that have reached the end of their lifetime is an issue to be addressed.
- Review relevant international experiences and consolidate the different ideas already brought up in this context (such as an idea of a modular lamp design, where the base of the CFL with much longer lifetime than the glass part of a CFL lamp can be re-used and the replaceable glass part recycled
- Discussions with local CFL manufacturers for recycling burnt out CFLs to extract mercury from the washed glass.

Thank You!

