

Energaia 2008

Euro-Mediterranean Day (11 December 2008)



**MED3: National Experiences in the Field of Energy Conservation
(with a focus on the building sector)**



Energy Efficiency in the Buildings Sector: Egyptian Experience

By

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Energy outlook

Concerning Primary Energy:

- In 2007 Egypt's primary energy total consumption was 63 mtoe. This is expected to reach 210 mtoe by 2030.
- In 2007, primary energy consumption was mainly in industry (34%) and residential and commercial buildings (23%). The latter is expected to reach more than 35% by 2030.
- In 2007, oil and natural gas accounted for more than 90% of primary energy consumption.
- N.G. consumption reached 35 bcm; about 60% of this gas is used for power generation.
- Oil products consumption reached 28 mtoe; about 40% in transportation.
- Different studies have shown that the primary energy supply will not meet demand starting from 2015; this gap is widening after 2020.

Energy outlook (continued)

Concerning Electricity:

- In 2007, current installed capacity was 22000 MW. This is expected to reach 74000 MW by 2030. which would require the addition of more than 50000 MW of new generating plants.
- The peak demand was 18500 MW. It is expected that this demand will reach 62000 The electric energy consumption was more than MW by 2030.
- It is expected that installed capacity will reach 74000 MW by 2030, The peak load will reach 62000 MW.
- Electric energy consumption reached about 100 TWh in 2007; this is expected to reach 353 TWh by 2030.
- In 2007, electricity consumption in residential (36%), commercial(7%) and governmental(5%) buildings reached 58% of total electric energy demand in Egypt.
- This almost 60% share is expected to increase.

Talking about the past to learn out of it

- The old historical Egyptian temples and residences were among the first energy efficient (EE) buildings in the world based on the current knowledge of bioclimatic, green, desert, passive and ecological building principals.
- The famous Egyptian well known Hassan Fathy is a pioneer in ecological architecture that considers all above mentioned issues in addition to the human and local culture dimensions in desert or arid areas.
- Houses, palaces and city walls was built based on sun baked bricks made of Nile mud and straw while Stone structures were mainly used for temples and tombs.

Talking about the past to learn out of it (contd.)

- The absence of rain, the scarcity of wood and an abundance of sunshine made adobe the preferred building material.
- Not surprisingly, given the scarcity of fuel, the ancient Egyptians rarely used burned bricks.
- the venerable art of building with adobe was adopted for all buildings, stones from rock was reserved for the dead and the gods.
- Most of the ancient Egyptian buildings practices and culture have unfortunately almost disappeared leaving no trace in our modern massive building construction even among those which are constructed in the middle of the desert.

Talking about the present to improve its status

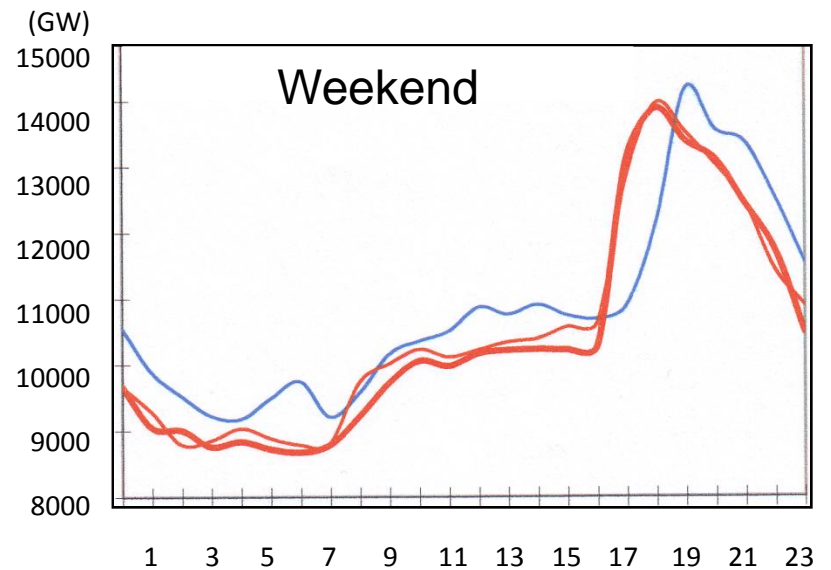
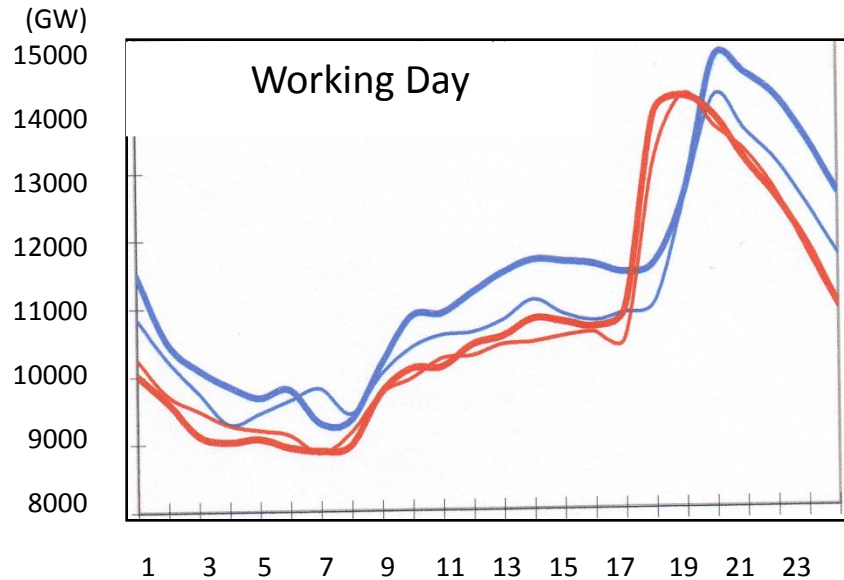
Seymour Jarmul (an EE advocate architect) in his famous book:

*Architect's Guide to Energy Conservation:
Realistic Energy Planning for Buildings*

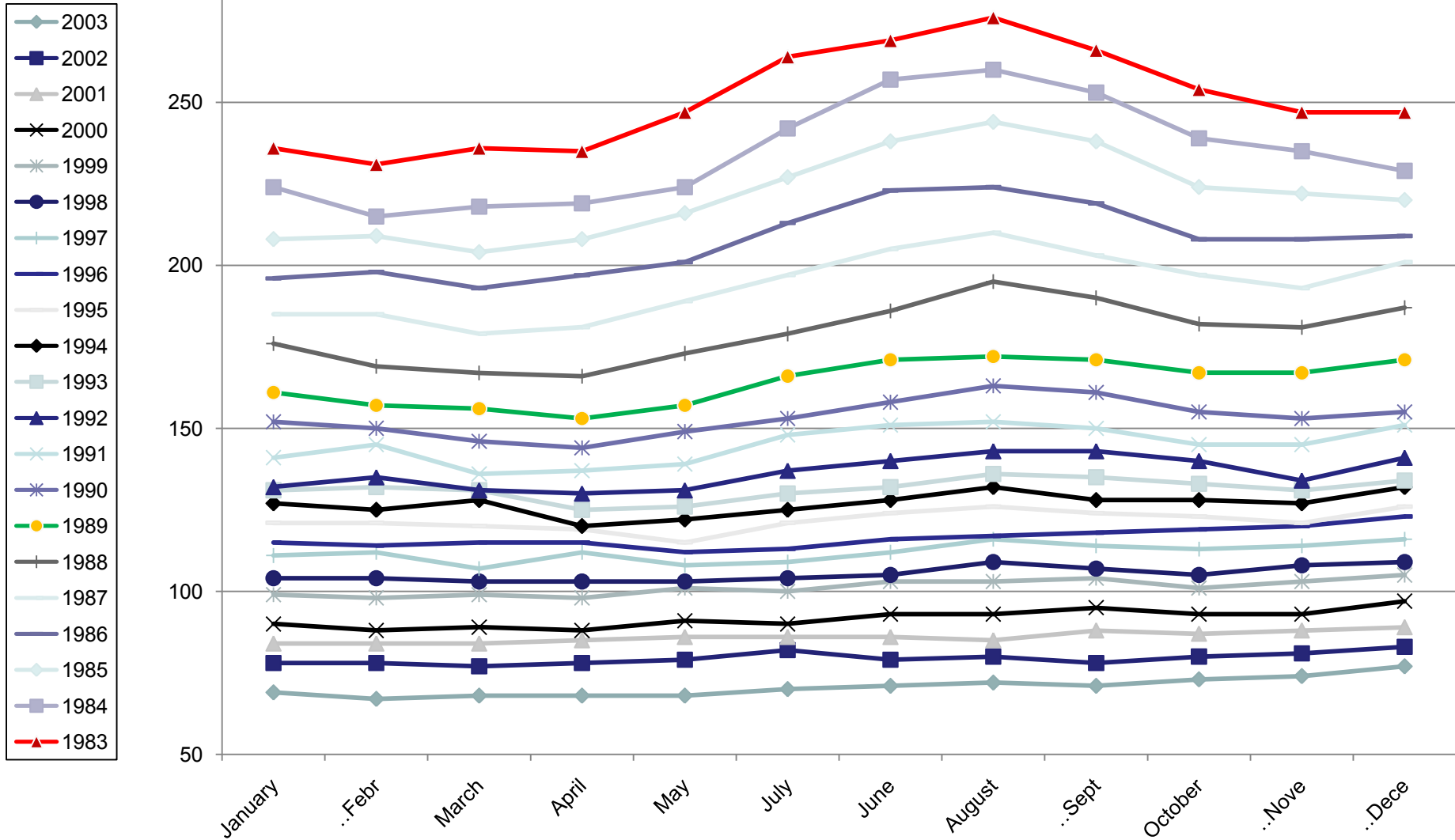
says:

"It is an axiom of the building process that the earliest decisions are the most important. The architect's design concept has energy consequences and establishes the limits within which all subsequent energy decisions are made."

Electricity daily load curve dominated by residential and commercial electricity use

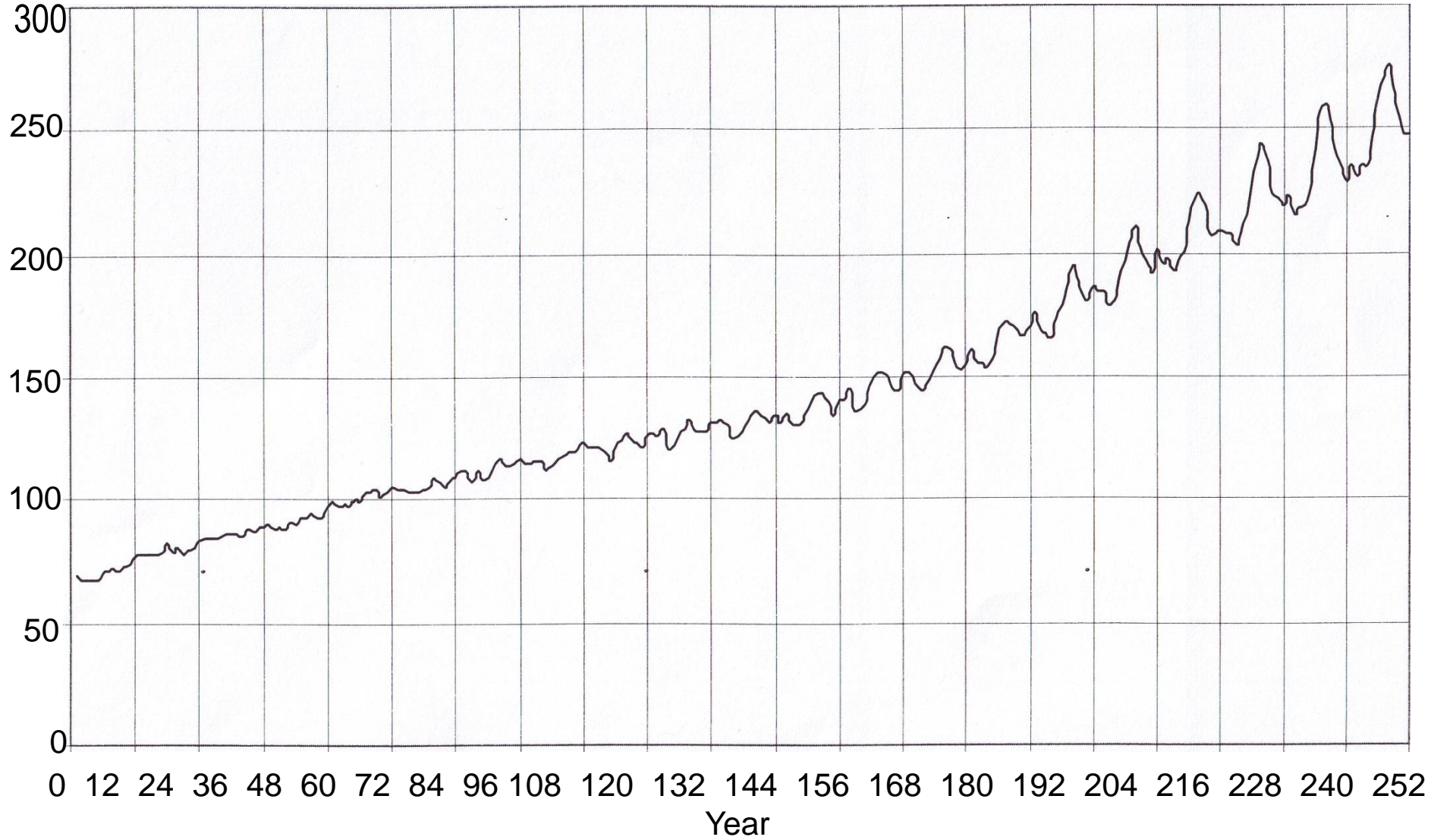


Evolution of the yearly load curve



Average Daily Energy (GWh)

(GWh)



EE practices in The buildings sector in Egypt

- Different scattered EE activities have started in Egypt since early 80s mainly through international aid programs with a little concentration on buildings' sector.
- There is no institutional “God Father” for the EE in Egypt, which has yielded in a poor coordination of efforts and a little accumulation of gained experiences.
- A new Governmental Agency is planned to be created by a presidential decree in the coming two months.
- A running project in cooperation with GEF and UNDP has initiated the creation and issuing of energy building codes, however this project is about to reach to its end.
- Some other EE building oriented regional projects, programs and or initiatives including Egypt are under way.

Efficient Lighting Program

- In Egypt, the share of lighting in all sectors in terms of electric energy consumption accounts for nearly 25 % of the total energy sold in the country : The residential and commercial sectors consumes nearly 25% of their energy -estimated at about 18% of the total energy – for lighting purposes, the lighting consumed by the industrial sector accounts for 3%, while the public lighting and government buildings lighting accounts for nearly 4% .
- Most of the lighting used in Egypt is low efficient and is largely responsible for the system peak time electricity production; in the recent years air conditioning is playing also a major role in formulating the daily peak demand. It also represents the important part of the electricity bills.

Efficient Lighting Program

- Diversified efforts for encouraging the use of the CFLs and electronic ballasts are taken. Assisting local manufacturers, implementing demonstration projects, involving NGOs and increasing awareness are also among these efforts.
- Currently, a mechanism is being settled; the electricity distribution companies are implementing a selling program for CFLs and electronic ballasts to their customers through installments with a provided guarantee through the installment period.
- Test results have assisted local manufacturers to improve the performance of their products.
- A larger diffusion of the CFLs by increasing market size from a quarter of a million by 1999 to 4 millions by 2007. knowing that the potential is about 150 million lamps.
- Decrease the price of CFLs from 35 L.E (5 Euro) in year 1999 to around 15 L.E (2.15 euro) in year 2007 for a good quality lamp.
- Achieving an accumulated energy saving of 0.778 MTOE and a CO₂ reduction of 2.274 mtons.

Egyptian Governmental Buildings (EGBs) EE Directives

- EGBs represent a high share of electricity consumption reaching representing about 5.4% of the total energy consumption. The high rate of consumption necessitated an urgent action to be taken where a study has been conducted in year 2003/2004 to study and investigate the energy efficiency and conservation opportunities within the EGBs.
- As a result of this study the cabinet has issued a directive to apply EE measures in EGBs starting energy audits and by applying efficient lighting applications.

Residential and commercial buildings energy codes

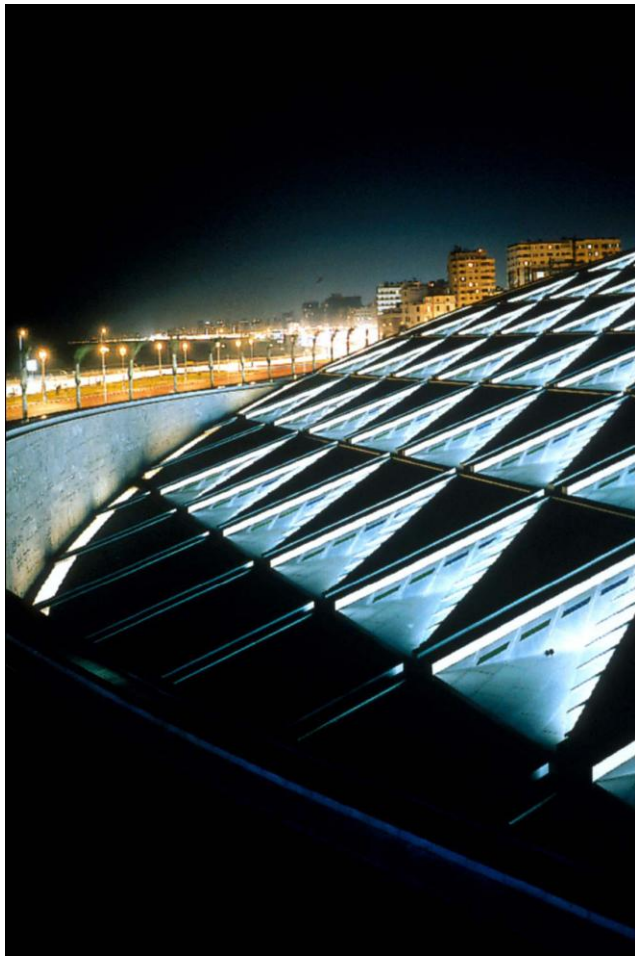
- Housing and Building Research Center (HBRC) of the Ministry of Housing has developed energy efficiency building codes for residential and commercial buildings, moreover has introduced a new activity for the development of an energy efficiency building code for the administrative buildings to improve energy efficiency in Egyptian governmental buildings.
- The residential energy code gives minimum requirements to improve both thermal and visual comfort in non-conditioned buildings as well as minimum energy efficiency requirements in conditioned buildings.
- The developed codes gives also minimum energy performance standards for building detailed components and envelop.
- A Ministerial Decree was issued in 2006 by the Minister of Housing including the Residential Building Energy Efficiency Code,
- The final draft code for Commercial and administrative buildings have been presented in a public review during August 2008 for finalization in order to issue them by a ministerial decree.

Energy Efficiency Standards and Labels for household appliances

- Energy efficiency standards and energy labels for room air conditioners, refrigerators, and clothes washing machines are already developed and issued by a ministerial decree. It has started by a voluntary period and followed by a mandatory one.
- More standards and labels have been developed for the electric water heaters, the electronic ballasts and the compact fluorescent lamps, they have been approved by the Egyptian Organization of Standards in order to be issued through a Ministerial decree.
- Lack of stakeholders and customers awareness and knowledge continue to hinder achieving objectives.
- The absence of a neutral accredited testing laboratory, the verification of the efficacy and the enforcement of the standards and labeling program is still one of the barriers preventing its successful implementation.

**Examples
Of
Energy Efficient Buildings
In
Egypt**

Bibliotheca Alexandrina, Alexandria, Egypt



Abu Tig Marina Town, El-Gouna, Red Sea, Egypt (Aga Khan Award for Architecture)





Refurbishment of an administrative building Solar cooling at the Red Sea

Egypt, Sharm el Sheikh

Floor space: 567 m²

South Sinai Governorate Project:
Administrative building with training facilities
and accommodation for students

Partners: Egyptian Solar Energy Society (ESES),
Egyptian Energy and Environmental Society (EEES),
Egyptian Environmental Affairs Agency (EEAA)

Refurbishment of an administrative building at the Red Sea

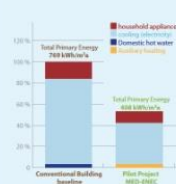
BASIC MEASURES WITH HIGH / MODERATE COST EFFICIENCY

- special Daikin thermal insulation with reflective coating on the roof
- 24 sealed windows to prevent air leakage
- 20 additional shading devices
- 60 energy efficient light bulbs
- Occupancy sensor for lighting control in two corridors

DEMONSTRATION MEASURE: SOLAR COOLING SYSTEM

- 3 lithium-bromide Rotartica absorption chillers with total refrigeration capacity of 24 kW
- 82m² evacuated tube collectors to supply 85°C hot water to the chiller

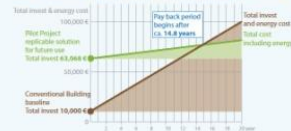
ENERGY CONSUMPTION



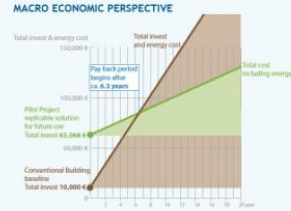
TOTAL INVEST



PILOT PROJECT FOR LARGE DISSEMINATION („REPLICABLE VERSION“)



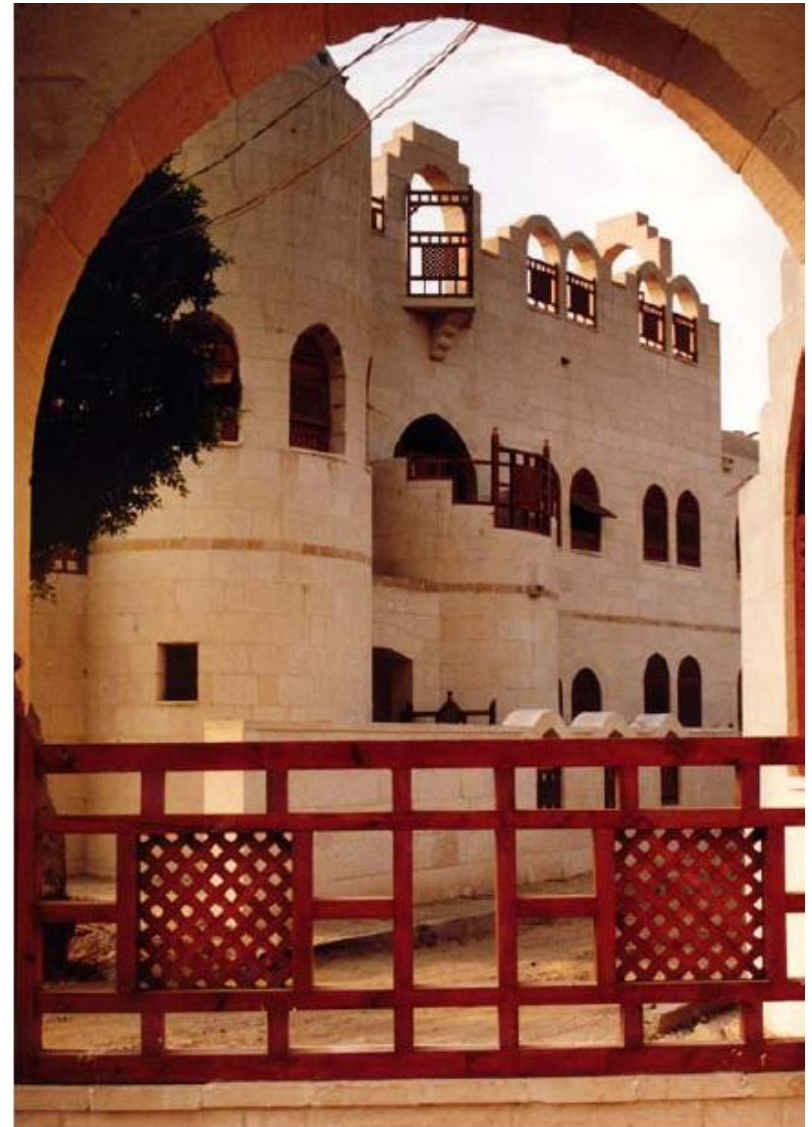
PILOT PROJECT FOR LARGE DISSEMINATION („REPLICABLE VERSION“)



Conclusions:

- (1) The energy consumption of the existing building is reduced by almost 47% through the implemented refurbishment measures, mainly due to the solar cooling and passive measures.
- (2) However, cost-efficiency of the realized pilot project is moderate (30 years) due to high learning cost and difficult access to products and know-how:
 - the roof insulation paint had to be transported from Japan by airplane to meet the timing schedule
 - cutting-edge technologies such as absorption chillers and tube collectors for solar cooling were imported from Europe and China to Egypt for the first time as one off products.
- (3) Taking into consideration a large scale dissemination of the applied measures and thus benefiting from learning and scale effects, the „replicable solution“ becomes an attractive investment as shown in the chart on the left side.
- (4) When realizing this „replicable solution“, significant additional benefits for the country in form of reduced energy subsidies arise. Considering these benefits, the State may have an interest in subsidizing this type of building, reducing thus the pay-back as shown in the graph on the left.

*Cultural Park for Children, Cairo, Egypt
(Arches, domes and walls are of local stones)*



Residence of Adam Henein (sculptor)

Harrania Village - Cairo, Egypt

The house is located on the outskirts of a recently built residential area



Balat Excavation Centre, Balat, Dakhla Oasis, Egypt
(main workshops and store houses; 7 individual rooms)



Halawa House

Agami, Alexandria, Egypt



Inshas Guest house 2007 by Dr. Sherif El-Gohary 2007





American University of Cairo Desert Development Center

Sadat City and South Tahrir, Alexandria desert road, Egypt



Centre of Planning & Architectural Studies

Heliopolis - Cairo, Egypt



Merci pour votre attention