



Mediterranean and National Strategies for Sustainable Development

Priority Field of Action 2: Energy and Climate Change

Energy Efficiency and Renewable Energy

Egypt - National study's summary

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1. Egypt's energy situation, related challenges, and energy sustainability indicators

The energy sector in Egypt is managed through two different ministries, the Ministry of Electricity and Energy (MOEE) and the Ministry of Petroleum (MOP). The energy infrastructures for oil, gas, and electricity in Egypt are adequate and covering most of the populated areas in the country. It also includes facilities to assist the exports of these energy carriers to other countries. These exports represent now a matter of debate as the balance between Egypt's local demand and its production capacity based on declared proven reserves became questionable.

Energy activities are one of the major sources of pollution which might represent a threat to the ecosystem; land, water and air. Oil spills off-shore oil exploration and half of Europe's oil export passing the Red Sea, Suez Canal and the Mediterranean can all cause a threat to the environment. However, an environmental law was issued in 1994 aiming at environment protection and regulating measures and precautions. The total GHG emissions were estimated at 137.11 Million ton of CO₂ equivalent in 2004/2005, out of which more than 70% was emitted by the energy sector including about 35% attributed to the electricity sector. Several project proposals have been made to mitigate this effect. Many of these proposals are being considered by the Egyptian Designated National Authority (DNA), who has announced in January 2007 that CDM projects portfolio included more than 40 projects of which 29 have been accepted and/or approved by the DNA.

Securing energy resources and production to meet the national demand both on the short and long terms, along with adequate attention to environmental concerns, are considered vital elements for sustainable development. Hence, to face these challenges Egypt adopted different measures to increase the role of RUE and RE in the energy supply and use matrix. This orientation was supported by the very high potential of RUE and RE which are not completely exploited. Egypt is also still in the development phase of legislation supporting the use of RE & RUE. A proposed electricity act is currently under development. It would include some legislation favorable to RUE and RE in terms of obligations or commitments on both energy producers and consumers to assign a part of their production capacity and/or consumption to be from RUE and/or RE. In the same time a renewable energy fund has been established between MOEE and MOP funded from the difference between the international and local price of fuel saved by using RE. This difference will be split equally between the two ministries. The share of MOEE will be directed to support RE. Another incentive tool is that the Egyptian Electricity Transmission Company (EETC) bears the cost of wind farms connection to the 220 kV transmission lines until and including 22 kV in addition to paying a tariff per kWh about 10% higher than that paid to conventional generation companies.

The New and Renewable Energy Authority (NREA) was established in 1986 to implement the RE strategy and update it in view of evolving RE trends. NREA mandate included the development of RE resources as well as conducting information dissemination and training programs to raise the public awareness on RE. However, RUE activities are scattered among several entities which hinders its evolution and decreases its impact in the total energy scene.

Egypt depends currently to a great extent on fossil fuel, oil and natural gas, to meet the increasing demand on primary energy, where fossil fuel satisfied about 94% of primary demand in 2004/2005 including 50.4% as oil share and 43.6% as natural gas (NG) share. The rest is mainly met through hydropower at 4.75% and coal at 1.25% for the same year. The primary energy demand has grown at an average annual rate of 4.64% during the last 25 years 1981/1982 – 2004/2005. During the same period, the oil demand has grown at an average annual rate of 3.34% while the increase in NG demand was much faster at 13% annual rate. Renewable Energy (RE) has only contributed to primary energy demand by about 0.2% at 2004/2005. Energy (RUE) accumulating effect is estimated to avoid a demand on primary energy evaluated at 0.5% to 1% during the same year.

The electric energy demand has increased during the period 1981/1982 – 2005/2006 at an average annual rate of 6.64% causing a consequent increasing demand on primary energy mainly fossil fuel where hydropower contributed only by 4.72% from primary energy demand. However, the contribution of hydropower in meeting primary energy demand has decrease from 13.18% in 1981/1982 to 4.72% in 2004/2005. During the last 10 years (1995/96 to 2004/05) the average annual growth rate of final energy demand reached 4.2%. During 2004/05 the shares of different sectors demand in final energy consumption were: 40.7% for industrial, 31.2% for transport and 22% for residential and commercial.

As for primary energy production, it has grown at average annual rate of 2.26% (almost one half of the primary energy demand growth rate), during 1981/1982 – 2004/2005. Oil production has increased during this period at only 0.13% annual average while natural gas has increased rapidly at an annual average of 11.4% reflecting the new discoveries of NG resources. The notice that primary energy consumption average annual growth rates exceeded that of primary production reflecting the challenge Egypt is facing in the next years. Oil resources has not changed in the last 10 years and become almost constant at 3.7 Billion Barrel of oil (bbl) without any significant increase. However, this issue is somewhat balanced by the coming on line of natural gas for meeting increasing demand with reserves estimated at 67 trillion cubic feet on January 2006.

2. RUE and RE policies and progress achieved

Egypt is on the way to develop its own "National Sustainable Development Strategy". Efforts are being coordinated through the Ministry of State for Environmental Affairs with all concerned stakeholders to draft the strategy. A ministerial committee has been established for this purpose headed by the Minister of State for Environmental Affaires and assisted by a technical group constituted of representatives of all concerned ministries. Energy is a major component of this national sustainable development strategy. The sustainability of energy calls for a sustainable long term vision for the energy supply/demand balance scenarios including maximizing the use of all available renewable resources, as well as setting quantitative targets and necessary mechanisms to insure the rational use of available resources. Also, minimizing the negative impact on the environment represents an integral part of energy sustainability.

The creation in late 2006 of the Supreme Council of Energy as well as the undergoing formulation of the National Sustainable Development Strategy which in energy represents one of its major components, will facilitate the coordination of all existing policies and orientations into a well defined integrated energy strategy that defines quantitative measurable targets for the enhancement of the wide spread use of both RE and RUE. As a matter of fact, RE has received more attention and growth due to the existence of a national organization (NREA) taking the responsibility of developing its activities. However, RUE is not adopted by one entity, is very much less developed.

The RE potential in Egypt is very high. In the Western Bank of Gulf of Suez the estimated potential is 20000 MW, which is almost equal to the overall installed capacity in 2004/2005. The present grid connected wind power plants installed capacity reached 230 MW, while the short term plan targets to reach 850 MW by year 2010 or about 3% of electricity demand; the long term target is to reach 3000 MW by 2021/2022 or about 7% of electric demand all on the Gulf of Suez, saving about 3 Mtoe annually. For the Integrated Solar – Combined Cycle System Power Plants, a 150 MW installed capacity power plant including 30 MW solar thermal part is planned for 2010 and long term plans target two similar plants each 300 MW installed capacity by 2020. There are also about 200 thousand Domestic Solar Water Heating units now installed in Egypt where the typical unit contains 2 meters squared of flat plate collector's area and 150 liters storage saving about 0.085 mtoe annually. Photovoltaic systems capacity for different applications has reached about 5.2 MW peak in 2005/2006 with largest share for telecommunication applications and small remote isolated roads far from the national grid.

To assess RUE and RE development status and based on the availability of data, different indicators have been presented and analyzed in the study report. Also, the report discusses the decoupling between energy efficiency evolution and economy. This analysis is based on the ratio between the primary energy consumption and GDP based on PPP annual growth rates. This ratio which fluctuates by about $\pm 10\%$ around the value of one reflects that energy and economy are still strongly coupled together.

The evolution of total energy intensity since 1981/82 till 2004/05 reveals that its value is quasi-constant at 0.19 Kgoe/ \$ PPP 2000 with a variation of $\pm 10\%$ with a minimum of 0.17 in 1981/82 and a maximum of 0.21 in 1990/91 and 2004/05. There is no clear trend of improvement in Energy intensity on the national level.

3. Barriers

Many barriers are hindering the development of RUE and RE such as economic and financial barriers due to subsidized conventional energy prices and the absence of well defined legislation supporting RUE or RE, institutional barriers of having two ministries responsible for energy issues which make integrated energy planning more difficult, and market barriers.

To overcome the present barriers, this report proposes a package of interdependent and integrated set of actions and measures to be adopted by the parliament, the government represented in the cabinet and concerned ministries, energy users associations, and energy service companies.

4. Success stories

Three success stories were presented:

One case study on: Energy Efficiency Labeling (EEL) for household appliances

- Energy efficiency label is what consumers actually see when they go to purchase an appliance. It provides consumers with information to make informed choices, encourages manufacturers to improve the energy performance of their models, and encourages distributors & retailers to display efficient products. Egypt has already developed and issued three standards (together with its corresponding labels) for three electric appliances, namely refrigerators, air conditioners, and washing machines.
- The Government of Egypt had succeeded in obtaining a fund for the establishment of an accredited energy efficiency testing laboratory to support the national energy efficiency standards and labeling program. The energy efficiency testing laboratories for the washing machines and the refrigerators have been accomplished and ready for testing since 2005. However, the one for air conditioners was already operational during late 2006.

Two case studies on wind energy resource assessment and development

- With its 230 MW wind farms installed capacity, Egypt is on top of all African and Middle East countries in grid-connected wind power generation. Since the late 1970s, Egypt started considering the use of RE where several bilateral and multilateral agreements were signed and implemented to explore potential horizons of RE use.
- RE resources assessments studies were conducted where the wind resource study pointed out to the great wind potential the Gulf of Suez is endowed with. This result stimulated world wide interest in developing such studies along with implementing pilot and field testing projects. The success of those projects coupled with the elaboration of Wind Atlas for Egypt, allowed the country to cross thus stage to large scale commercial utilization.
- Of equal importance, was the willingness of developed countries that already have an advanced record in wind resource utilization and its equipment manufacture, to cooperate with Egypt and offer adequate financing facilities from the beginning, particularly to compensate for the higher cost of RE

compared to conventional and enable wind power projects development. Such countries included Germany, Denmark and at the beginning, then currently include Spain and Japan.

- The development of large scale grid-connected wind farms have had several benefit to the country either direct or indirect among which are: saving natural gas and oil, contributing to capacity building and know-how transfer, protecting the environment through the use of clean energy, contributing to develop remote desert areas, and finally stimulating local manufacture of about 25% of wind project material.

5. Proposals for more sustainable energy development

- The energy sector is still playing a vital role in Egypt's economy. However, the Egyptian government currently faces a real challenge to make a strategic choice between satisfying the ever increasing national primary energy demand (depending by more than 94% on oil and gas) that is being offered to end-users with subsidized prices, and maintaining a certain level of hard currency revenues from oil and gas exports at world prices, even with a growing risk of accelerated depletion rates of national proven reserves. As it has been discussed earlier, different scenarios expect that if current practices in the energy sector will continue as it is, Egypt will become a net oil importer during the near future which would increase the share of NG in the energy supply local matrix in addition to binding existing commitments of long term export contracts that would rather increase and accelerate its depletion rate. This tendency if continues should certainly lead to a non sustainable energy future that government and citizens should work hand in hand from now to avoid its occurrence.
- Being aware of this fact, Egypt's energy strategic framework has adopted RE and RUE as policy options within the strategies of main organizations of the energy sector. RE received more attention and reached a reasonable level of exploitation as a specific ministry (MOEE) has abided by its responsibility and created a dedicated organization (NREA) for the development of RE national strategy and bearing the duty of its implementation. However, RUE has not yet got its sponsor "god father" who would develop a national strategy, set quantifiable objectives, propose or develop tools and legislations, monitor and follow up achievements, and assesses impacts and accumulated experiences and lessons learned to modify and improve future plans.
- Lastly, there is another important part affecting the success of any proposed sustainable energy development approach, which is the energy end-user. All proposed policies are often drafted, revised, approved, and adopted by technocrats and professionals representing only the supply side of the energy chain. This scheme had functioned well for the conventional forms of energy (being commodities) like electricity, NG, and oil products. However, the same scheme has failed to succeed in the case of RUE and non bulk RE utilization as in most of the cases the end-user find him self requested to get involved in a process much different from just buying a "commodity". To be successful, RUE and RE strategies together with accompanying tools and measures have to be developed through deep negotiations and intimate involvement of end-users associations.