

Ministry of Electricity & Energy (MEE)
New & Renewable Energy Authority (NREA)



The Wind Energy Status And The Technology Transfer Activities In Egypt

Eng. Wael Salah Taher

Egypt



Demonstration wind farms

Small scale systems at Matrouh Governorate on the Mediterranean coast

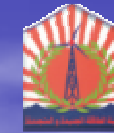
- Two grid connected systems one is 6x25Kw Wind turbines installed at Ras-Elhekma village and the second is 3x25Kw wind turbines at El-Rowysat village(1997)
- A hybrid wind / diesel system of 5x25 Kw turbines +2x100 Kw diesel engines at a remote village and connected to 380 v local grid



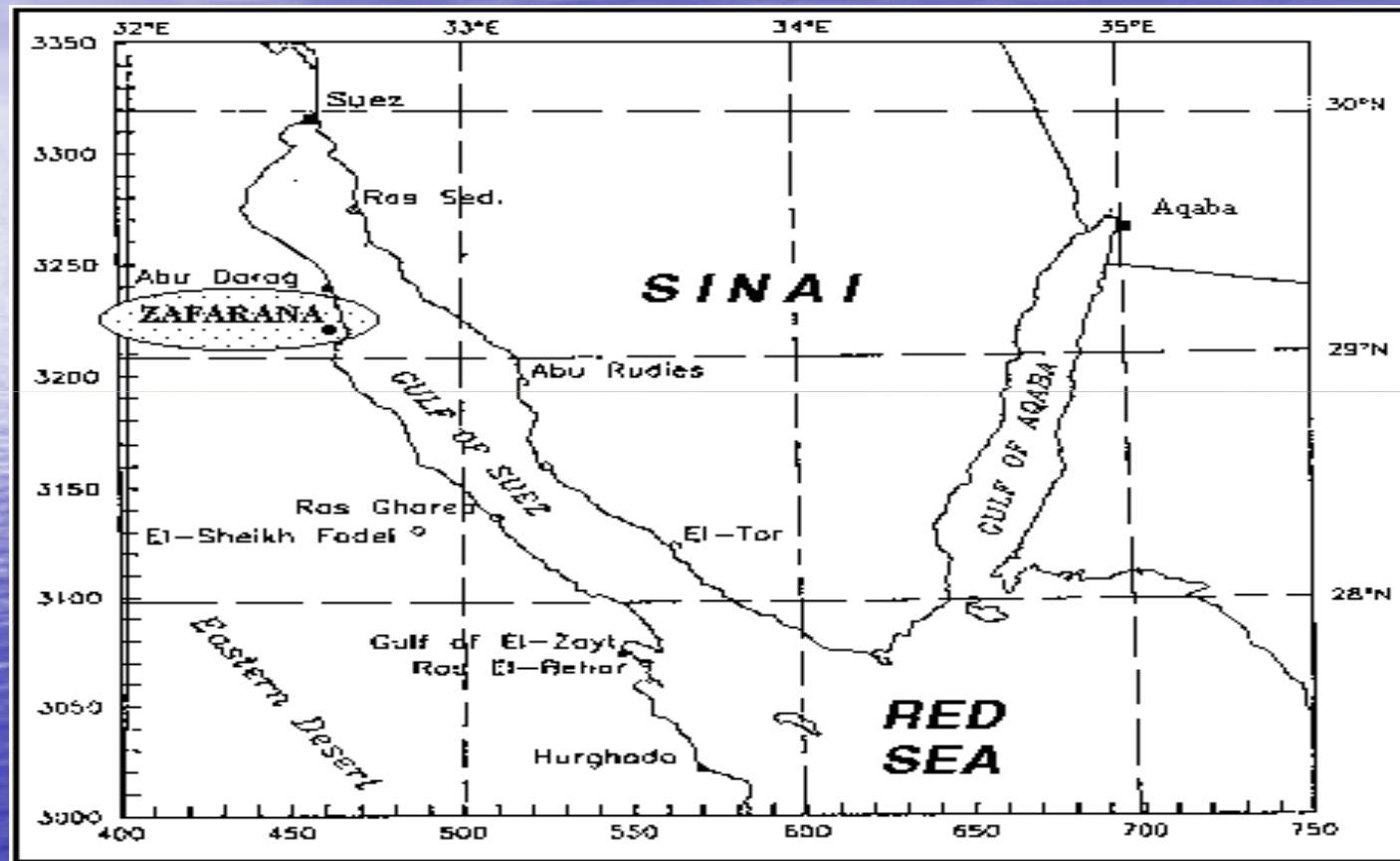
Ministry of Electricity & Energy (MEE)
New & Renewable Energy Authority (NREA)



25 Kw wind turbine with wooden blades placed on tubular tower of 15m height



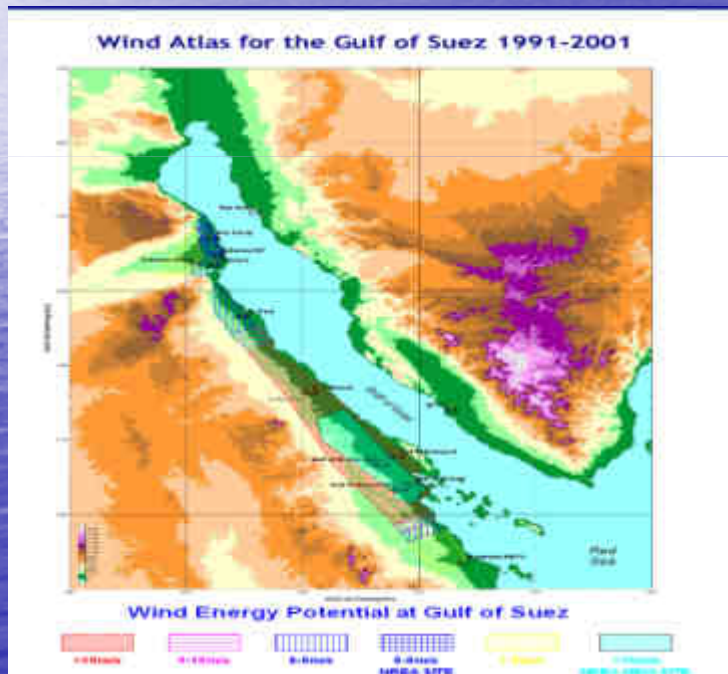
Ministry of Electricity & Energy (MEE) New & Renewable Energy Authority (NREA)



**Ministry of Electricity & Energy (MEE)
New & Renewable Energy Authority (NREA)**



In 2003, a detailed Wind Atlas of Suez Gulf area which includes accurate wind data over period from 91 – 2001 for (13) sites was finalized by the cooperation with Danish government.



Region	Av. Wind Speed (m/s)
Ras Sedr	7.5
Abu Aldarag	8.8
Zafarana (North)	9.2
Zafarana	9.0
Zafarana (west)	7.5
St. Paul	8.4
Ras Ghareb	10.0
El Tour	5.6
El Zeit Gulf (Average)	10.5
Hurghada	6.7



5.2 Mw wind farm at Hurghada on the Red Sea coast

The farm includes 42 units with different technologies and capacities from US, Denmark, and Germany (2blades, 3blades, pitch control, stall control, lattice & tubular, tower 100&300 Kw units). Some components were locally manufactured such as blades, towers, mechanical and electrical joints which represent about 40% of the wind turbine (1992).

Ministry of Electricity & Energy (MEE)
New & Renewable Energy Authority (NREA)



Technical Performance Indicators in 2008/2009. of 5.2 MW wind farm at Hurghada at Red Sea Coast.

Average wind speed (m/sec)	Capacity * factor (%)	Availability ** factor (%)	Generated electricity/year (GWh)
5.9	15	77.9	7

* Capacity factor = $\frac{\text{Generated electricity}}{\text{Installed capacity} \times \text{No. of hours of the year}}$

** Availability factor = $\frac{\text{No. of hours of the year} - \text{No. of outage hours}}{\text{No. of hours of the year}}$



Ministry of Electricity & Energy (MEE)
New & Renewable Energy Authority (NREA)

A side view of Hurghada wind farm





Large scale grid connected wind farms on Suez Gulf

A- Zafarana

An area about 80 Km sq earmarked for NREA to implement large-scale grid connected wind farms. The infrastructure of the site has been completed including substations 22/220 Kv, residential buildings for staff, workshop and internal roads.

An area of about 64 km sq to the west of the site was earmarked as an extension for the same site.

Ministry of Electricity & Energy (MEE)
New & Renewable Energy Authority (NREA)



Zafarana 425 MW Wind Farm

The farm has been implemented and operated into stages, since 2001, in cooperation with Germany, Denmark, Spain and Japan. The turbines with different technologies and capacities



Zafarana projects

Zafarana (1) Danida

30 Mw 50x600Kw Nordex Since April 2001

Zafarana (2) KFW

33 Mw 55x600Kw Nordex Since may 2001

Zafarana (3) Danida

30 Mw 46x660Kw Vestas Since Nov 2003

Zafarana (4) KFW

47 Mw 71x660Kw Nordex Since June 2004

Ministry of Electricity & Energy (MEE)
New & Renewable Energy Authority (NREA)



Zafarana (5) Spain

85 Mw 100x850Kw Gamesa Since Sep 2006

Zafarana (6) KFW

80 Mw 94x850Kw Gamesa Since March 2008

Zafarana (7) JICA

120 Mw 142x850Kw Gamesa Since Feb 2008

Zafarana (8) Danida

120 Mw 142x850Kw Gamesa under construction

Ministry of Electricity & Energy (MEE)
New & Renewable Energy Authority (NREA)



Technical Performance Indicators in 2008/2009. of 425 MW Zafarna wind farm.

Average wind speed (m/sec)	Capacity * factor (%)	Availability ** factor (%)	Generated electricity/year (GWh)
7.3	29.3	79.2	941

* Capacity factor = $\frac{\text{Generated electricity}}{\text{Installed capacity} \times \text{No. of hours of the year}}$

** Availability factor = $\frac{\text{No. of hours of the year} - \text{No. of outage hours}}{\text{No. of hours of the year}}$



Ministry of Electricity & Energy (MEE)
New & Renewable Energy Authority (NREA)

A side view of Zafarana wind farm





B- Gabal El-Zeit.

700 km sq was earmarked at Gabal El-Zeit.
The new site is classified with excellent wind speed that reaches to 10.5m/s and can host about 3000 Mw wind power plants



Statistics

Item	2006/2007	2007/2008
Peak load (Mw)	18500	19370
Total install capacity (Mw)	21944	22583
Wind	230	365
Total produced energy (GWh)	114260	125145
Wind	635	847



National strategy for wind energy up to 2020

In April 2007, the Supreme Council of Energy in Egypt has adopted a resolution, on an ambitious plan to cover 20% of the generated electricity by renewable energy by 2020, including a 12% contribution from wind energy, translating about 7200 MW grid-connected wind farms. Such plan gives a room enough to the private investments to play the major role in realizing this goal. It is anticipated that about 400 MW/year will be undertaken by the private sector and NREA will carry out about 200 MW/year.



Lands for the projects :

Wind Atlas for Egypt indicates that there are many promising areas to host wind energy projects, particularly on the Gulf of Suez, East & West of the Nile Valley. Currently procedures are being taken to earmark the following areas

Ministry of Electricity & Energy (MEE)
New & Renewable Energy Authority (NREA)



(a) 1300 km sq as an extension of NREA site at the North of Gabal El-Zayt

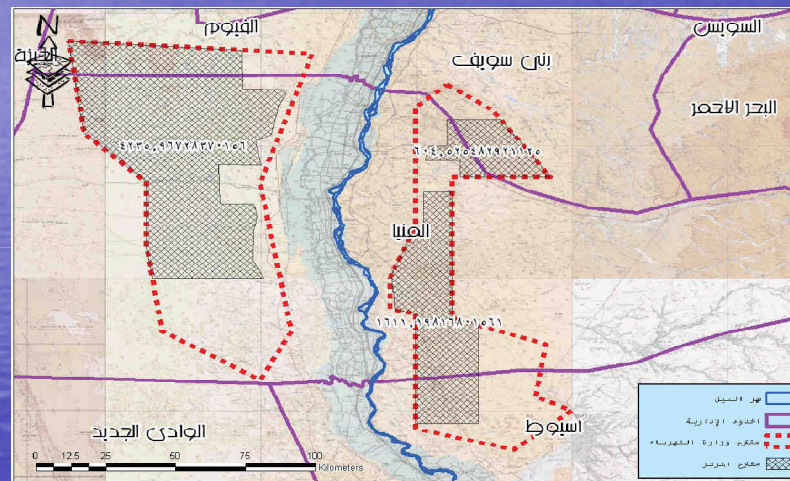
(b) Areas at upper Egypt

*604 km sq East of Nile River, Governorates of Bani Swaif & AlMenia.

*4236 km sq West of Nile River, Governorates of Bani Swaif & Al-Menia.

*1611 km sq East of Nile River, Governorates of Al-Menia & Assuit

Ministry of Electricity & Energy (MEE) New & Renewable Energy Authority (NREA)



Ministry of Electricity & Energy (MEE)
New & Renewable Energy Authority (NREA)



Technology transfer activities

It was established in cooperation with Denmark in 1992 as manufacturing the blades of Wincon100 Kw turbines in Suez shipyard and Nordtank 300Kw turbines in Arab Organization Industry and towers in Iron and Steel company.

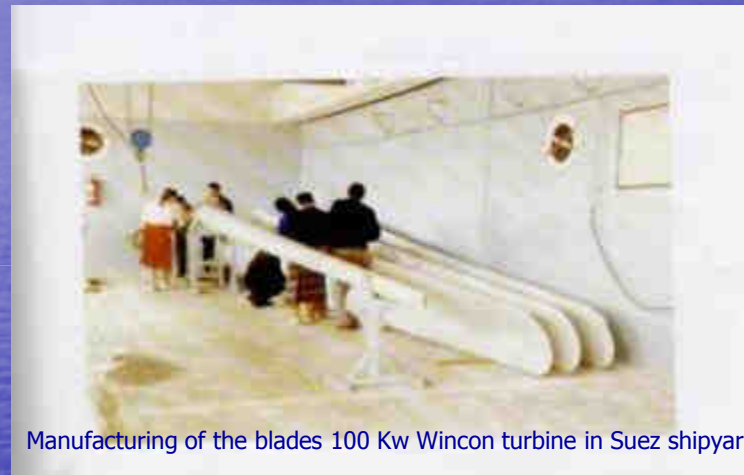
Ministry of Electricity & Energy (MEE)
New & Renewable Energy Authority (NREA)



in 1995 the cooperation with Riso national laboratory for Testing and certification of wind turbines and Power quality assessment “Power quality has been executed at Hrghada site (11 kv substation) as well as at Zafarana substation (22 kv)”.That's in addition to cables and civil works. The towers of Zafarna projects were manufactured in Egypt too.



Ministry of Electricity & Energy (MEE) New & Renewable Energy Authority (NREA)



Manufacturing of the blades 100 Kw Wincon turbine in Suez shipyard



Ministry of Electricity & Energy (MEE)
New & Renewable Energy Authority (NREA)

