

# Energy and Sustainable Development in the Mediterranean

Libya Presentation

Monaco 29-30/03/2007



Energy and Sustainable Development in the Mediterranean



# Energy Situation



- Libya is an important oil country
  - Total proven oil reserve 35 billion barrels ( 2005)
  - Total proven natural gas reserve 53TCF (2005)
- Export revenues sharply increased to \$ 34 billion in 2006 from \$ 5.3 billion in 2000
- Oil export revenues represent 90% of total revenue
- Libya is hoping to reduce its dependency on oil and to increase investment in tourism, mining and natural gas, .....



# Energy Situation



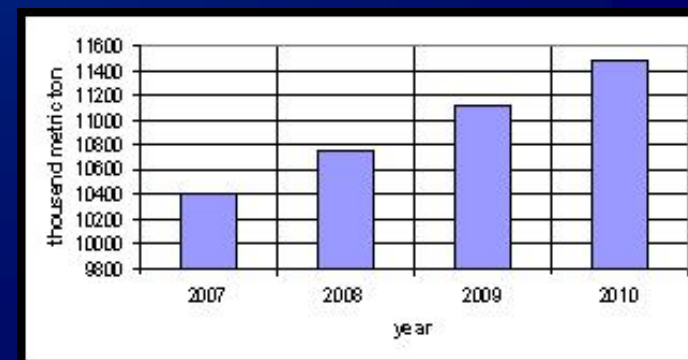
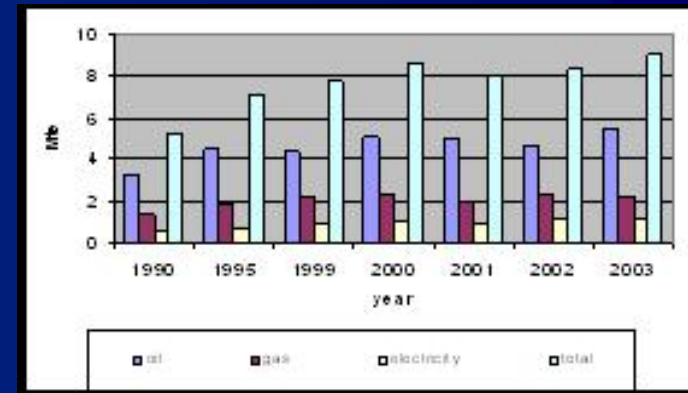
- GDP has increased from 29 billion \$ in 1986 to 46 billion \$ in 2005
- TPES has increased from 9.7 Mte in 1990 to 17.7 Mte in 2003 ( 5 % growth )
- 57-68 % oil share in TPES ( 1990-2000)
- The share of natural gas increased because of using natural gas in electrical power generation.



# Energy demand



- Total energy demand has increased from 5.4 Mte in 1990 to 9.1 Mte in 2003.
- Oil sector has highest consumption (61%)
- Future total energy demand 11.5 Mte in 2010.



# Electrical energy demand (2005)



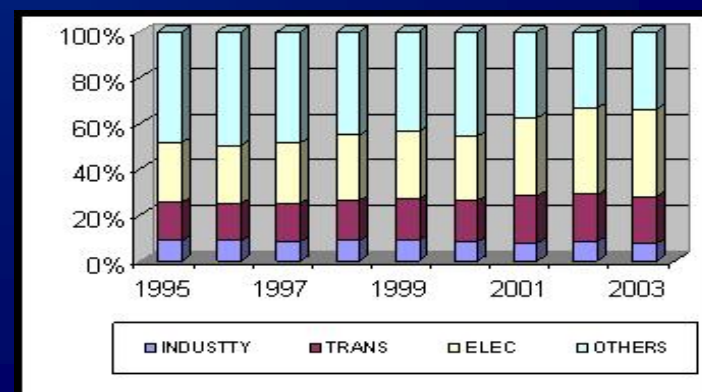
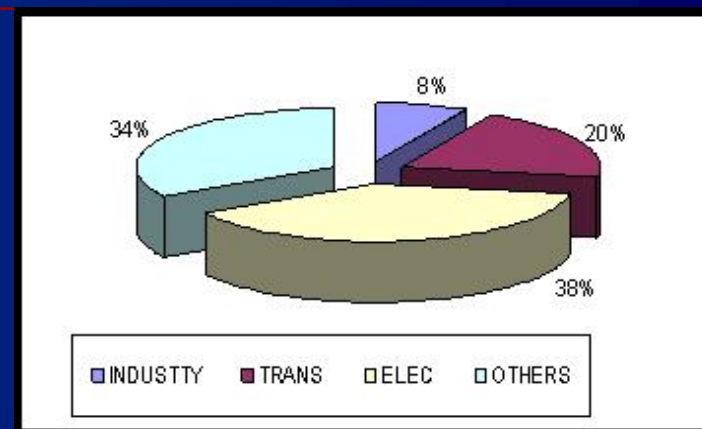
- Total installed capacity 5125 MW
- Electrical energy generated 22500 GWh
- Peak load 3857 MW
- Energy consumption per capita 3119 kwh
- Residential sector represents 39 % of the total consumption
- Forecasted peak load in 2020 8000 MW
- Desalination plants will play a major drive of energy demand in Libya :
  - Total installed during next five years about 1 million meter cub per day.
  - Total energy needed is a bout 1.8 TWh/y.



# Environment:



- The main emitters of CO2 in 2003
  - Power generation sector
  - Transportation sector
  - Industry sector
  - Other sectors
- Energy related emissions are responsible for almost 100% of CO2
- CO2 emissions increased from less than 18.7 Mt in 1980 to 50 Mt in 2003 ( 8% average)
- Libya is already signed the kyoto protocol
- Libya is eligible to the CDM



# Rational use of energy ( RUE )



## Potential of RUE

- The potential impact of improved energy utilization efficiency and energy management can be quite significant (reduce the demand by 50 million barrels of oil in 2020 ( 20%)).
- This could amount to 2160 MW reduction in electricity capacity in 2020.
- A lot of reduction needs to be done to decrease the energy intensity for all sectors especially for industrial and transportation.



# Rational use of energy ( RUE )



- There are no programs in Libya toward RUE
- This situation due to :
  - Low electricity tariff
  - Cheap oil prices
  - Lack of national policy
  - Lack of specialized institution
  - No deep details studies

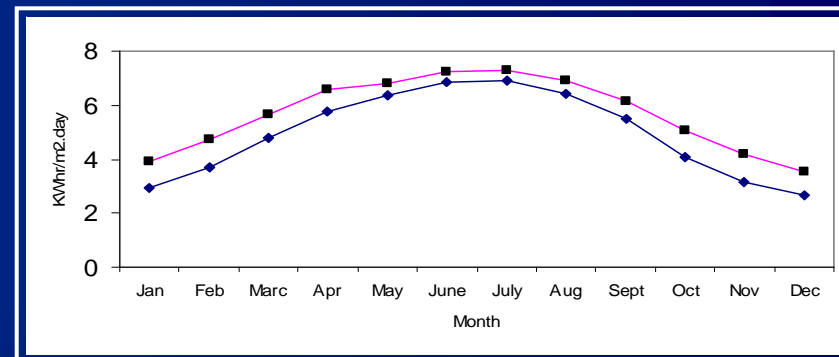


# Renewable Energy

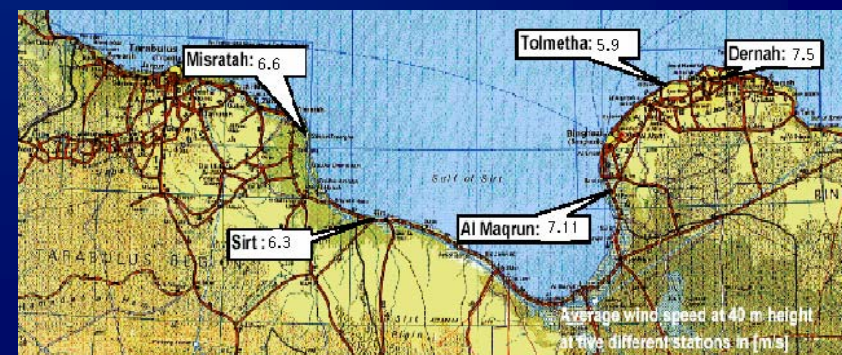


## Potential

- Very high Solar radiation
- Wind Speed (high Potential)



Average monthly daily global radiation



Average monthly wind speed





- Share of renewable is very small (.05 %).
- This situation due to



# TOTAL PV INSTALLED (2006)



Applications	Number of systems	Total power [ KWp]
Communication	120	690
Cathodic protection	320	650
Rural Electrification	440	405
Water pumping	40	120
Total	920	1865





- Wind energy projects

- Almost, no projects have been installed
- 25 MW Pilot wind project “ under negotiation “ to be installed by GECOL
- Wind atlas .



# National RE Strategy



- The target is to reach 10 % of electric energy demand by 2020
- Short term plan 2006-2010
  - Short term plan needs 500 Million \$.



# National RE Strategy



- Long term plan 2010-2020

Technology	Total
PV	10 MWp
Wind	450 MW
Thermal solar Water heating	20,000 m <sup>2</sup>
Thermal electricity	20 MW
Thermal Desalination	20,000 m <sup>3</sup>
Hydrogen	20 KW





- Objectives of implementing this strategy
  - Unify the national efforts towards the achievement of the strategy target.
  - Transfer know how
  - Support R&D
  - Capacity building



# CASE STUDIES



1- Rural Electrification Using PV Systems

2-using PV Systems For Communications.

3- Pilot Wind Farm Project



# Rural Electrification Using PV Systems



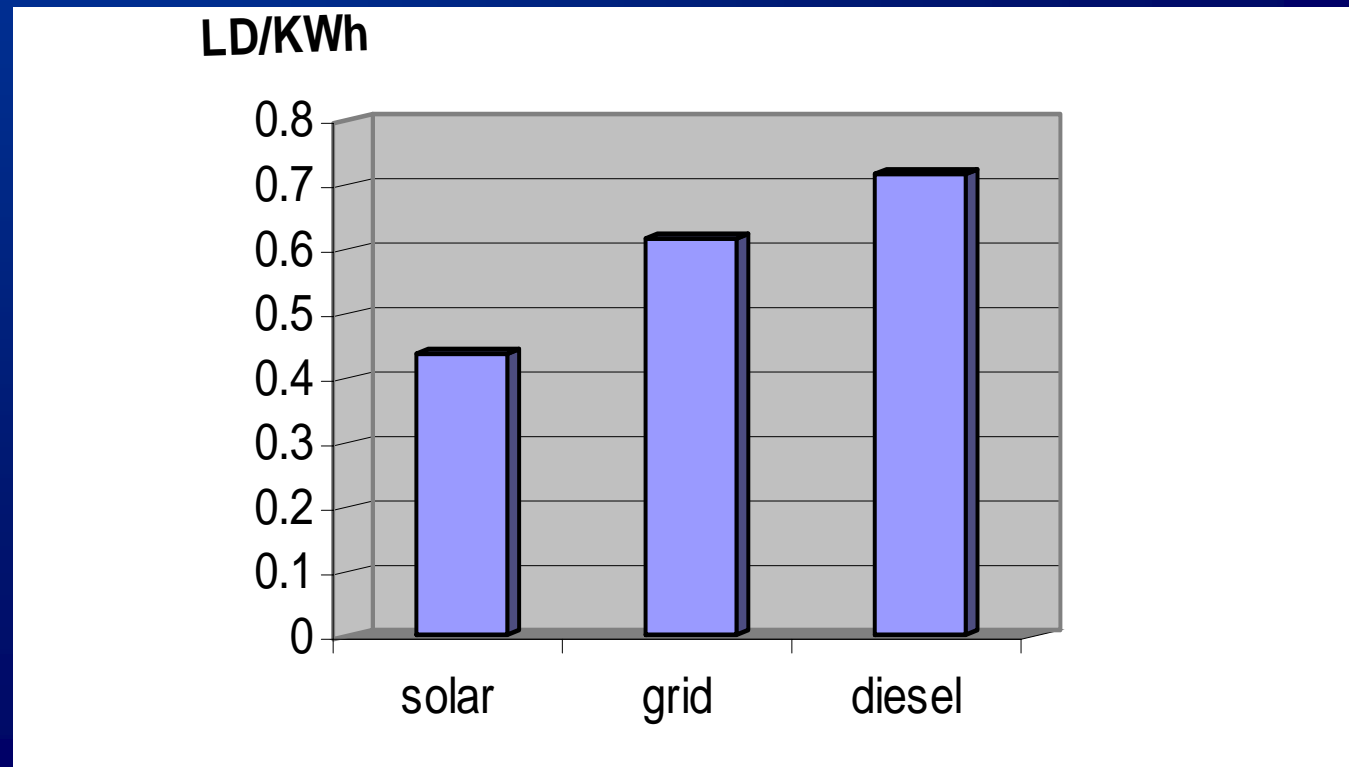
- Site : Marrair-Gabis
- 39 families ( 350 inhabitants )
- Options to supply electricity
  - Grid
  - Diesel generator
  - Photovoltaic systems



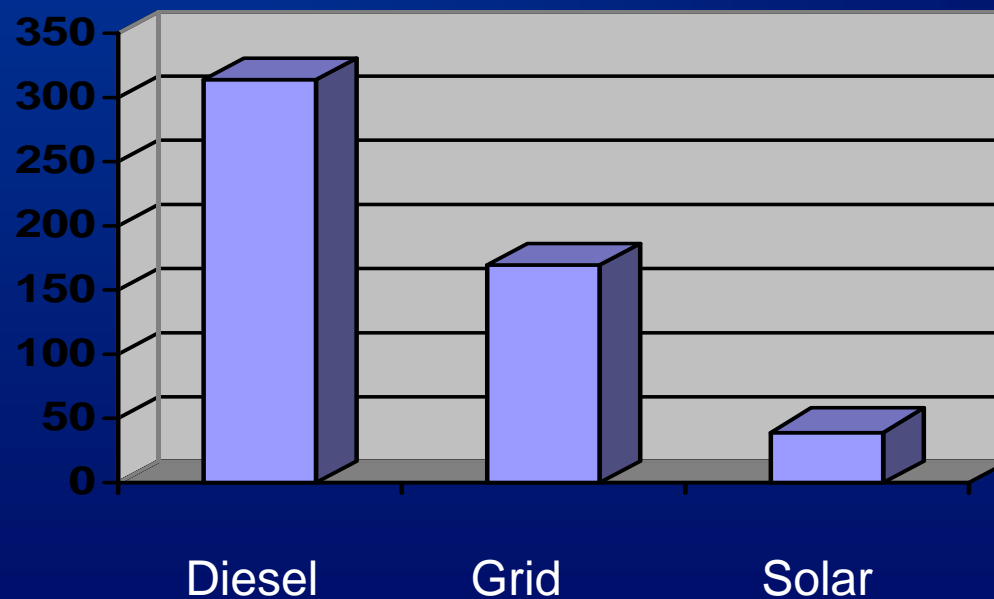
# Rural Electrification Using PV Systems



## ■ Results



## 2-using PV Systems For Communications



# 3- Pilot Wind Farm Project



## ■ Sites

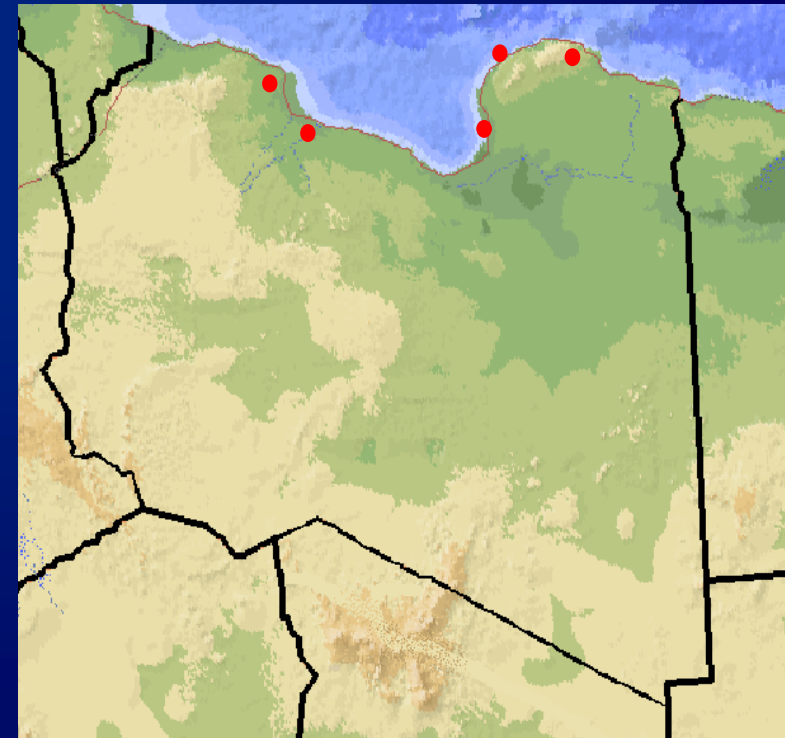
1 - Misratah

2 - Sirt

3 - Al Maqrun

4 - Tolmetha

5 - Dernah



# 3- Pilot Wind Farm Project



## ■ Results of measurement campaign

Site and height above ground level [m]	V <sub>mean</sub> in [m/s]	Weibull-parameters	Power density in [W/m <sup>2</sup> ]		
A [m/s]		K			
1 - Misratah	50 m	6.8 m/s	7.6 m/s	2.35	305 W/m <sup>2</sup>
2 – Sirt*	50 m	6.7 m/s	7.6 m/s	2.53	285 W/m <sup>2</sup>
3 - Al Maqrun	50 m	7.4 m/s	8.4 m/s	2.42	399 W/m <sup>2</sup>
4 - Tolmetha	50 m	6.4 m/s	7.2 m/s	1.69	365 W/m <sup>2</sup>
5 - Dernah	50 m	8.3 m/s	9.3 m/s	2.67	504 W/m <sup>2</sup>





# ACTIONS TO BE TAKING FOR A MORE SUSTAINABLE ENERGY DEVELOPMENT



**Energy and Sustainable Development in the Mediterranean**



# Actions To Be Taking For A More Sustainable Energy Development



- Developing and implementing policies and programs to change the current energy production and consumption patterns through :
  - Improving energy efficiencies in all sectors
  - Promoting the use of renewable energy resources



# Actions To Be Taking For A More Sustainable Energy Development



- Supporting R&D, Technology transfer and industrial development of sustainable energy technologies.
- Utilizing the available bilateral, regional and international technical cooperation and funding mechanisms.
- Call for all organizations and institutions to put more emphasis on developing and implementing educational , capacity building and public awareness programs for sustainable development.





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