

Country Study Morocco



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SUMMARY



- **Overview of Electricity in Morocco**
- **Laws about Renewable Energy & Energy Efficiency in Morocco**
- **Renewable Energy Potential in Morocco**
- **Cooperation CDER/GTZ (Wind Energy)**
- **Wind Farms programmed (2008-2012)**
- **Wind Farms installed in Morocco**
- **Conclusion**



OVERVIEW OF ELECTRICITY IN MOROCCO

ELECTRICITY IN MOROCCO IN 2007



- **Dependency : 96 %**
- **50 Billiards DH for imports of energy products in 2007 (4.3 Billiards Euro)**
- **Annual average consumption growth of electricity : 8 %**
 - **Electricity Consumption : 22608 GWh**
- **Electricity production : 19101 GWh**
 - **ONE : 6047.5 GWh (26.74 %)**
(National Utility of Electricity)
 - **Private Producers : 13021.6 GWh (57.60 %)**
 - * **JLEC(1360 MW-Coal)**
 - * **Tahaddart(384 MW-Gas)**
 - * **CED (50 MW-Wind)**
 - **Autoproducers : 32.5 GWh (0.14 %)**
 - **Import (Spain) : 3506.5 GWh (15.51 %)**

LAWS ABOUT RENEWABLES ENERGIES & ENERGY EFFICIENCY



- ❑ Production of Electricity in Morocco : ONE (National Utility of Electricity) + Private producers (BOT)**
- ❑ Distribution : ONE + Governmental companies + Private Compagnies in big cities**
- ❑ Until now, no Agency for regulation of electricity market**
- ❑ Price of electricity fixed by Government, about 1 DH/kWh (1Euro = 11.5 DH)**
- ❑ New Law about Renewables Energies & Energy Efficiency (in preparation);**
- ❑ New Law about autoproduction of electricity from 10 to 50 MW (12 June 2008);**
- ❑ Now, No ‘Feed-in-tariff’ for Renewables Energies in Morocco**
- ❑ Windfarms:International call of tenders or autoproducers projects**

ENERGIE-PRO PROGRAMME (AUTO-PRODUCERS PROJECTS)



- Auto-producers : Production & consumption of Electricity from wind energy by Industrials in the the same site of the factory or in others sites with a good wind potential via taxe of transport :**
 - 6 cDH/kWh (0.5 cEuro/kWh) until 2011**
 - 8 cDH/kWh (0.7 cEuro/kWh) from 2012**
- Maximum power : 50 MW by site of consumption (12 June 2008);**
- Average price to buy electricity from ONE (for industrials):
65 cDH/kWh (5.6 cEuro)**
- Possibility to sell Extra energy from Wind Farms to the national electrical grid (ONE) with a price of 70 % of “ONE-Tariffs”.**
- Garanty of Electricity to industrials in each time from ONE-Grid**
- Wind Farms Programmed by auto-producers: 710 MW(2010-2011)**
- Projects : Auto-producers or Auto-producers/Investors**



RENEWABLE ENERGY POTENTIAL IN MOROCCO

WIND ENERGY POTENTIAL IN MOROCCO



WIND ENERGY :

Morocco has an excellent wind potential mainly in the North & in the South :

- Essaouira, Tangier & Tetouan with an annual average between 9.5 & 11 m/s at 40 meters.**
- Tarfaya, Taza & Dakhla with an annual average between 7.5 m/s & 9.5 m/s at 40 meters.**

Wind Potential of Morocco :

- Total Potential : 7936 TWh/year (2645 GW)**
- Technical Potential : 4896 TWh/year (1632 GW)
(Electricity consumption in Morocco in 2007 : 22.6 TWh)**
- Wind Atlas of Morocco published in 1986 & 1995 and updated in 2007.**
- More than 50 measurements stations installed between 1990 & 2007**

COOPERATION CDER/GTZ



- **PSE/GTZ Programme (1990-2000):**
 - Installation of measurement stations in some sites in Morocco (After measurements, development of the Project El Koudia El Baida; Installation of 50 MW in 08/2000 & 3.5 MW in 03/2001)
 - Training for Engineers & Technicians from CDER about some aspects of wind energy in Institutes in Europe.
 - Publication of Wind Atlas of Morocco in march 1995
- **TERNA/GTZ Programme (1998-2002) :**
 - Installation of 3 measurement stations of 40 meters in sites of Cap Sim(Essaouira), Tarfaya & Foum El Wad (Laayoune) in collaboration with experts from Germany (DEWI Institute).
 - Situation now in sites :
 - Cap Sim(Essaouira) : Wind Farm of 60 MW (April 2007)
 - Tarfaya : International Call of Tenders launched in 2007 for Wind Farm of 300 MW (BOT)
 - Foum El Wad (Laâyoune) : Study for Wind Farms of 440 MW by autoproducers.

RENEWABLE ENERGY POTENTIAL

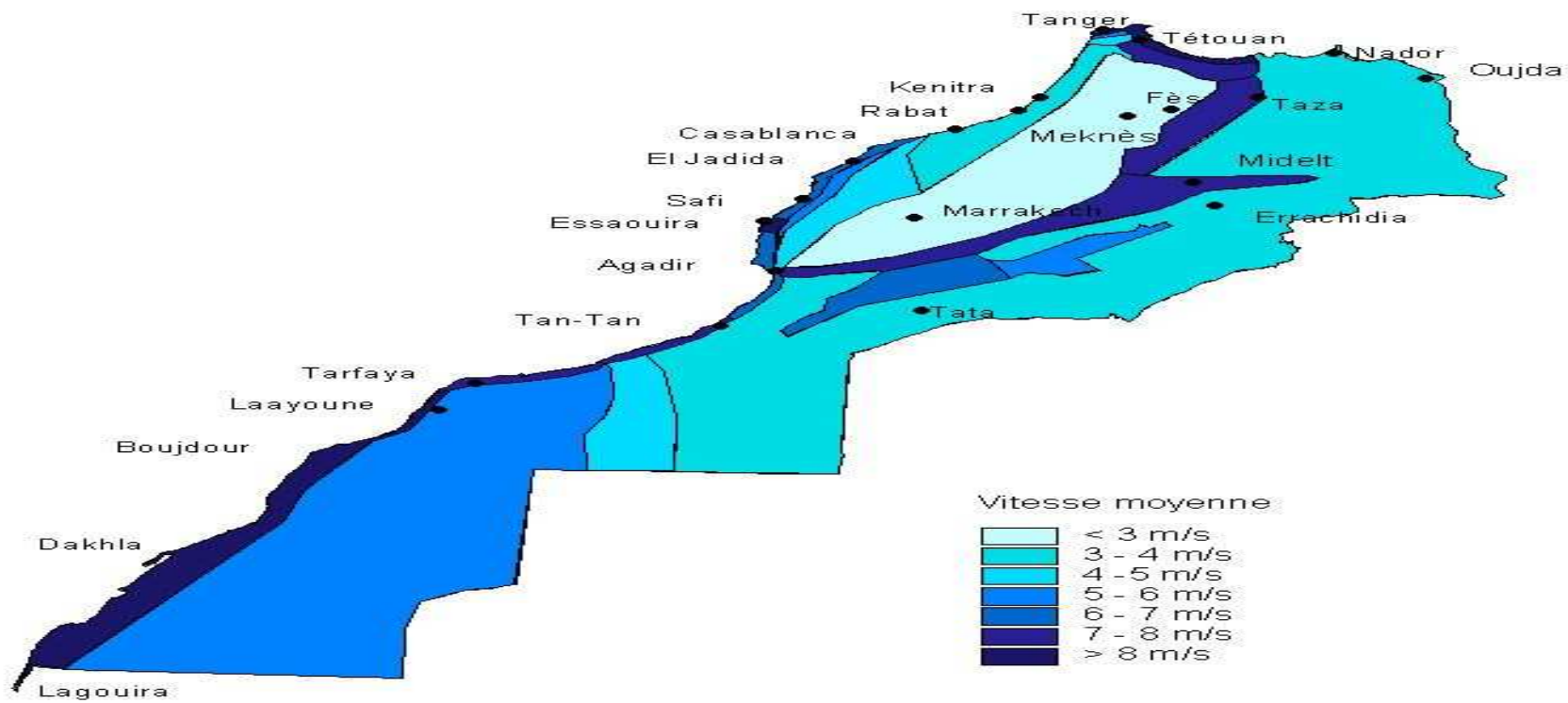


IN MOROCCO (MW or M²)

(Study CDER/GTZ – July 2007)

In MW	Potential 2010	Potential 2012	Potential 2020	Technical Potential	Total Potential
Wind	563	1,065	3,258	1,632,030	2,645,310
PV	35	79	2,018	10,829,876	31,206,435
CSP	30	180	780	8,827,600	25,436,850
Solar Thermal, Low temp. (m ²)	183,612	394,001	1,694,133	33,000,000	133,000,000
Micro- Hydro	1.5	2.2	3.5	23.2	26,000

WIND RESOURCE MAP OF MOROCCO



PROJECTS OF RE PROGRAMMED (2008-2012)



- **Objective of the Government : Production of 20 % of electricity from Renewable Energy (included Hydro).**
- **WindFarms Programmed : 1000 MW until 2012**
- **WindFarms installed : 124 MW (2007)**

Projects programmed :

- **WindFarm 140 MW (Tangier); 2009 (in construction)**
- **Gas + Solar Thermal : 472 MW (Oujda)**
 - * **Solar Thermal (20 MW); 2009**
- **Wind Farm 10 MW (Tan-Tan); Desalination seawater**
- **Wind Farm 300 MW (Tarfaya); Call of tenders launched in 2007**
- **Wind Farm 100 MW (Taza); (autoproducers)**
- **Wind Farm 240 MW (Laayoune); (autoproducers)**
- **Wind Farm 200 MW (Foum El Oud – Laayoune); (autoproducers)**
- **Wind Farm 60 MW (Sendouk – Tangier); (autoproducers)**



WIND FARMS INSTALLED IN MOROCCO

PROJECT OF 50 MW (El Koudia El Baida -Tetouan)



- **Project :**
 - ➔ **Power** : **50 MW (84 Vestas 600 kW)**
 - ➔ **Date production** : **8/2000**
 - ➔ **Production** : **195 GWh/year (2005)**
 - ➔ **Feasibility Study** : **CDER**
 - ➔ **BOT Project** : **CED (EDF-Germa / France)**
(selled to Theolia in december 2007)
- **Annual average wind speed
at 40 meters** : **10 m/s**
- **Annual average wind speed
in the best location in
the site at 40 meters** : **11 m/s**

PROJECT OF 50 MW
(El Koudia El Baida -Tetouan)



WINDFARM 60 MW CAP SIM (ESSAOUIRA)



- ➔ Power : 60 MW**
- ➔ Windturbines : 71 Gamesa
G52-850 kW**
- ➔ Date production : 04/2007**
- ➔ Production estimated : 210 GWh/year**
- ➔ Average wind speed (40 m) : 9.45 m/s**
- ➔ Feasibility Study : CDER**
- ➔ Project : ONE**
- ➔ Project Cost : 800 millions DH
(72 Millions Euro)**

***WINDFARM 60 MW
CAP SIM (ESSAOUIRA)***



12 12 2006

PROJECT OF 10 MW

Lafarge (Ciments Factory of Tetouan)



- Power : 10 MW**
- Windturbines : 12 * 850 kW (Gamesa)**
- Date production : 9/2005**
- Production estimated : 38 GWh/year (40 % of annual consumption of electricity)**
- Wind energy Production : for Ciments factory (extra energy sold to the national electrical grid)**
- Project Cost : 110 millions DH (10 Millions Euro)**
- Project 40 MW : Programmed in the same site**

PROJECT OF 10 MW
Lafarge (Ciments Factory of Tetouan)



CONCLUSION



- ❑ Morocco intends to benefit from exploiting its Renewable Energy resources and Energy Efficiency and is implementing sound legal and regulatory framework**
- ❑ Good contribution of GTZ experts for preparation of Laws & regulatory framework about Renewables Energies & Energy Efficiency**
- ❑ Private players can also contribute to realize the challenge**

Renewable Energy Development Center (CDER)



Thank you for your Attention

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