

# Wind Energy in Turkey



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EXTERNAL ARTICLE

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Turkey became acquainted with wind energy long time ago. In the Ottoman Empire period windmills were built for grinding grains and for irrigation purposes. There are many sites in Anatolia where windmills had been built and these places are restored and protected. Energy production is the key point in modernization of the nations. The total amount of energy consumed or produced determines the differences of the countries in terms of economical and technological development. But especially for the members of the European Union, besides the amount of production, produced energy has to be clean and renewable.

Turkey is surrounded by the Black Sea on the north, the Marmara and the Aegean Sea on the west and the Mediterranean Sea on the south, the country has a very long coast line of nearly 8500 km. The figures from the Organisation for Economic Cooperation and Development (OECD) show that Turkey theoretically has 160 TerraWatt hours a year of wind potential.

According to the last official information in Turkey, installed electric power capacity in 2006 is 40,565 MW and annual rate of increase in electricity demand is around 8-10%. Turkey produced 169,500 GWh of electricity in 2006 and consumed 143,070 GWh. Conventional thermal sources

cover the largest share of Turkey's electricity supply. These sources are predominantly lignite, hard coal, fuel oil and natural gas. From the point of view of annual energy production and installed power capacity, wind energy is a new born child but growing rapidly.

Turkey had started to produce electrical energy from wind energy in mid 1990's. As seen on [Table 1](#) and [Table 2](#) (information until the end of 2007), installed capacity of wind energy power stations was 146,25 MW at the end of 2006 (this magnitude has reached 200MW today) and this number refers to 0,2% of Turkey's total amount of installed power stations. Projects which have 144,40 MW rated capacity are still under construction. Apart from these in the years 2008 and 2009 a total amount of 531,66 MW in wind turbines will be put into service. In the year 2009 estimated total wind energy installed capacity will be 837,61 MW. As seen on [Fig. 1](#), Aegean, Mediterranean and Marmara regions are more concentrated in terms of geographical distribution of wind turbines that are installed or will be installed in 2009.

In addition to these, 751 applications were made by companies in the total amount of 77.871,4 MW installed capacity. EMRA is examining these applications and will announce the

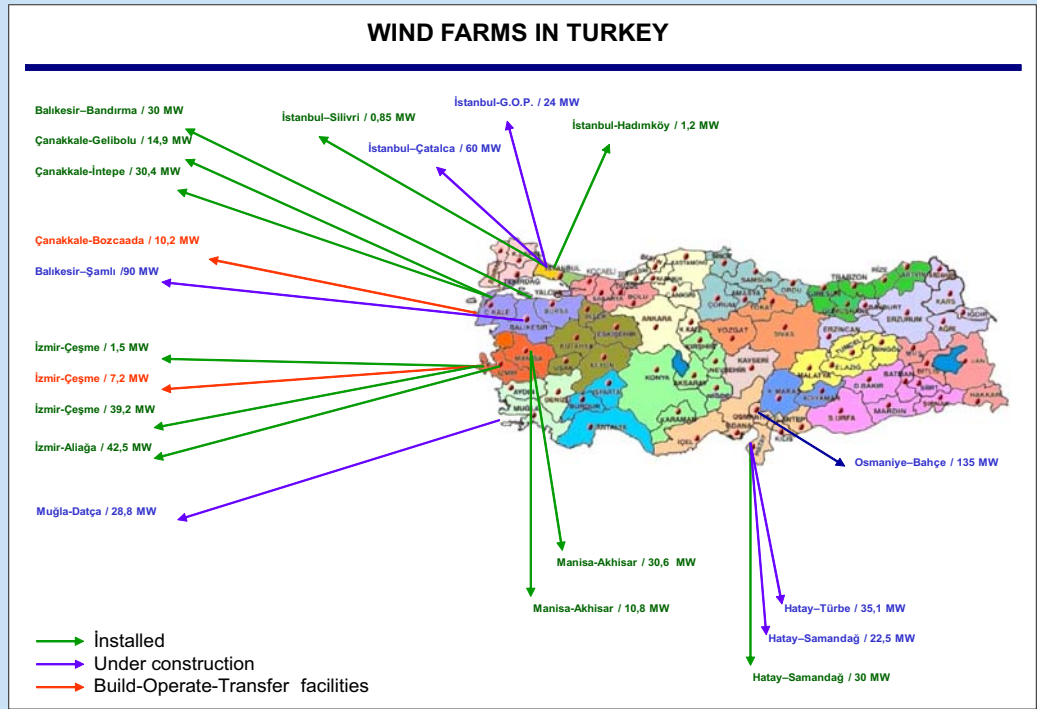


Fig. 1: Geographical distribution of wind energy power plants in Turkey

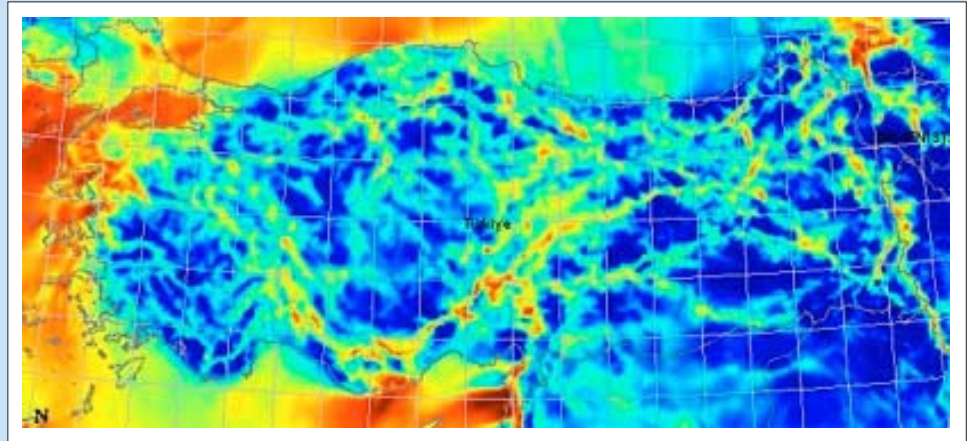


Fig. 2: REPA Wind Energy Atlas

evaluations most probably by the end of 2008. The distribution of the applications are mentioned below;

- 24% Aegean Region (Izmir 114, Manisa 23, Aydın 18, Muğla 15, Denizli 5),
- 49% Marmara Region (Istanbul 47, Edirne 15, Kırklareli 44, Tekirdag 18, Çanakkale 93, Kocaeli 11, Yalova 7, Sakarya 10, Bilecik 3, Bursa 26, Balikesir 87, ),
- 16% Mediterranean Region (Hatay 63, Mersin 32, Karaman 14, Osmaniye 5),
- 8% Black Sea Region (Ordu 7, Kastamonu 7, Sinop 6, Amasya 5, Tokat 4).
- 3% Other Regions

In March 2001, the Turkish government enacted a new Electricity Market Law, which sets the stage for the liberalization of power generation and distribution activities. Under the law, the state owned Turkish Electricity Generation and

Transmission Corporation (TEAS) was split into separate generation, distribution, and trade companies, with a goal of eventual privatization. Transmission of electricity (TEIAS and TEDAS) will continue to be run by the state. The new law also created the Energy Market Regulatory Authority (EPDK), which oversees the power sector and natural gas markets, responsible of the setting of tariffs, issuing licenses, and assuring competition. Within the terms of "Using Renewable Energy Sources aimed for Electrical Energy Generation Law" dated as of 18.05.2005, incentive methods have been determined for the manufacturer facilities. According to this revised law, Turkish government secures to purchase electricity for 10 years from the utilities which are using renewable energy sources. Tariffs are set between 5.0-5.5 ¢cent/kWh. But in the free market producers can make arrangements with higher tariffs.

Tab. 1: Specifies wind turbine projects which are installed and ongoing as of 05.11.2007 according to "Report of Wind Energy Sector" by TUREB & EIEI.

LOCATION	DATE OF PRODUCTION	INSTALLED POWER (MW)	MANUFACTURER
İzmir-Çeşme	1998	1,50	Enercon
İzmir-Çeşme	1998	7,20	Vestas
Çanakkale-Bozcaada	2000	10,20	Enercon
İstanbul-Hadımköy	2003	1,20	Enercon
Balıkesir-Bandırma	1/2006	30,00	GE
İstanbul-Silivri	2/2006	0,85	Vestas
İzmir-Çeşme	1/2007	39,20	Enercon
Çanakkale-İntepe	1/2007	30,40	Enercon
Manisa-Akhisar	1/2007	10,80	Vestas
Çanakkale-Gelibolu	2/2007	15,20	Enercon
<b>INSTALLED POWER</b>		<b>146,25</b>	
Manisa-Sayalar	2/2007	30,40	Enercon
Hatay-Samandağ	2/2007	30,00	Vestas
İstanbul-G.paşa	1/2008	24,00	Enercon
İstanbul-Çatalca	1/2008	60,00	Vestas
<b>PROJECTS UNDER CONSTRUCTION</b>		<b>144,40</b>	

Tab. 2: Shows the projects which have already reached an agreement with turbine manufacturers and will be put into service in 2008-2009.

Muğla-Datça	1/2008	28,80	Enercon
İzmir-Aliağa	1/2008	42,50	Nordex
Aydın-Çine	1/2008	19,50	Vensys
Çanakkale	2/2008	30,00	Nordex
İzmir-Kemalpaşa	2/2008	66,66	Enercon
Hatay-Samandağ	2/2008	35,10	Fuhrlander
Hatay-Samandağ	2/2008	22,50	Fuhrlander
Bilecik	2/2008	66,60	Conergy
Balıkesir-Şamlı	2/2008	90,00	Vestas
Balıkesir-Bandırma	2/2008	15,00	Vensys
Osmaniye-Bahçe	1/2009	130,00	GE
<b>TURBİNE PROCUREMENT CONTRACTED PROJECTS</b>		<b>531,66</b>	
<b>TOTAL AMOUNT</b>		<b>837,61</b>	

Electricity Works Survey Administration (EIEI) and State Meteorological Directorate (DMI) prepared a Turkish Wind Energy Atlas named REPA in 2006. This map has had a positive effect on the development of the wind energy sector. REPA has been compiled by using different softwares with long time wind data that are collected by DMI with 200m x 200m resolution. Average wind speed, wind power intensity data can be reached in varies altitudes. REPA provides access to wind speed data at 30m, 50m, 70m and 100m altitudes which cover the correlations of data, wind power intensity data at 30m and 50m altitudes, capacity factor, temperature and pressure data (Fig. 2).

Concerning environmental issues, the Ministry of Environment and Forestry made a written statement about signing Kyoto Protocol aimed at reducing global greenhouse gas (GHG) emissions. Companies which are in the renewable

energy sector are excited about the fact that negotiations will start in 2009. The Kyoto Protocol will force companies to invest more in diverse business areas, but in the long run it is estimated that the Protocol will impact the sector positively.

In conclusion Turkey has a large potential of renewable energy sources. Solar, hydro, geothermal and wind energy potentials are very impressive. Additionally, Turkey must use its large coastal line to build off-shore wind farms.

Finally, Turkey has come to a point where legal arrangements encourage renewable energy investments. These administrative conditions are helping to develop the use of wind energy.