

RENEWABLE ENERGY FOR CLEAN AND SUSTAINABLE FUTURE: ASSESSMENT AND DEVELOPMENT STRATEGIES OF WIND POWER IN TURKEY

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ABSTRACT

There is a substantial increase in energy demand in Turkey because of its growth of industrial development. Turkey's present energy resources are insufficient and the need for energy is growing rapidly. Turkey does not possess enough conventional fossil fuel reserves, but possesses rich renewable energy resources such as hydraulic, solar, geothermal and wind. Among all, wind energy seems to be the most suitable renewable energy resource for electricity production. This study is aimed to summarize the assessment and development strategies of wind power in Turkey. Considering the development of wind energy in the country, it may be concluded that the number of wind power plant installations will considerably increase in the future.

Keywords: renewable energy, wind energy, energy policy

1. INTRODUCTION

There is a substantial increase in energy demand in Turkey because of its growth of industrial development. In Turkey, thermal power plants, consuming coal, lignite, natural gas, fuel oil and geothermal energy, and hydro power plants produce electricity. A major problem Turkey faces now is to find the most suitable way of obtaining additional electrical power. The wind energy is rapidly developing renewable energy sources in the world and it provides a clean energy resource. According to an investigation done to find out the CO₂ emission economy in Turkey due to the utilization of renewable energy sources, CO₂ emission economy from the usage of wind power plants was found to be 3750 ton CO₂ MW per year when compared with coal power plants and 2275 ton CO₂ MW per year when compared with natural gas power plants [1].

Due to its geographic position, Turkey is under the influence of different air masses. These air masses give rise to potential wind energy generation possibilities in different areas [2]. Theoretically, Turkey has 160 TWh a year of wind potential, which is about twice as much as the current electricity consumption of Turkey [3, 4]. This study is aimed to summarize the assessment and development strategies of wind power in Turkey.

2. WIND ENERGY POTENTIAL OF TURKEY

Wind atlas, prepared to display areas potentially suitable for energy production from wind energy, describes statistical data on regional mean wind speeds and power densities. There are several wind atlas developed for Turkey since 1984 [5]. Oztopal et al. [6] prepared various maps based on 42 wind velocity measurement stations in Turkey and showed the regional variations of wind resource from the available data. According to the maps, the Aegean Sea coast is singled out, having the richest wind energy potential. Another potential wind region is the south-western part of Turkey along the Mediterranean Sea, such as Iskenderun. This study identifies five main locations as potential sites, in Turkey as Bandirma, Sinop, Gokceada, Iskenderun, Diyarbakir. Oztopal et al. [6] make a generalization that the sea coasts provide significant wind energy potential, whereas inland sites are

poor regions for wind energy generation. Dundar et al. [7] have made onsite surveys at 96 meteorological stations distributed homogeneously over Turkey. They evaluated the data gained from 45 stations for the preparation of the Turkey Wind Atlas using WASP (Wind Atlas Analysis and Application Program) model. Figure 1 illustrates the wind atlas of Turkey. Sahin [8] studied 68 wind speed measurement stations in Turkey and produces wind velocity exceedence maps over 10, 12, 15, and 20 m/s, and the necessary interpretations were given. These maps showed that especially the western part of Turkey and, particularly, coastal areas are risky locations for structural stability and wind erosion.

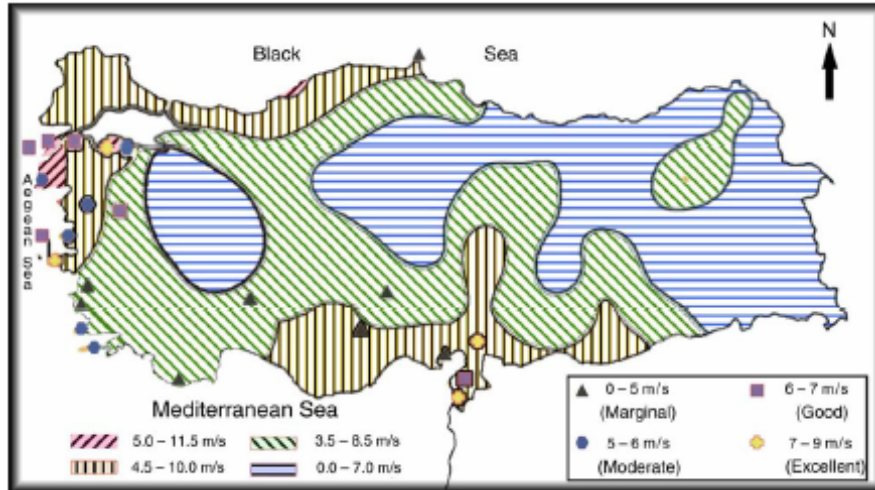


Fig. 1. Turkey Wind Atlas [7]

There are also many studies in the literature about Turkey’s wind characteristics [2, 9-19]. Since the Marmara, the Aegean and the Southeast Anatolia regions of Turkey are highly suitable for wind energy applications, most of researchers have focused mainly on these areas to calculate wind characteristics. Although the high wind energy potential, no studies are present in the literature concerning the north-western parts of Anatolia.

3. ASSESSMENT AND DEVELOPMENT STRATEGIES OF WIND POWER

Energy development in Turkey has been dominated by public investment and management since independence in 1923, although several waves of liberalization have been launched since 1983, leading to a gradual opening of the Turkish energy market and improving the situation. Turkey has made early and extensive use of financing models such as build-own-operate (BOO) and build-own-transfer (BOT). In the last decade, several encouraging steps have been taken towards greater liberalization. The notion of privatization has been introduced into the Turkish constitution for the first time. Legislation was adopted in February 2001 to allow competition in the electricity market and adapt Turkey’s legislation for European Union (EU) membership. A new Gas Market Law was adopted in May 2001 for the same purposes [20].

All, the MENR, the State Planning Organization (DPT) and the Electric Power Resources Survey and Development Administration (EIE) are involved in renewable energy promotion policies. Turkey’s renewable energy policies are being improved. Turkey’s State Planning Organization (DPT), together with the World Bank, is coordinating a project called the “Turkish National Environmental Strategy and Action Plan” to establish basic environmental standards and integrate sustainable policies into economic development. Currently, there are a few Government-backed incentives to promote renewable energy investments. The MENR is preparing a draft legislation which would allow certain renewable energy projects (mainly geothermal and wind, but also solar, wave, waste and landfill gas only) to be built and operated by the private sector, and provide incentives for such system. This legislation would also set the buy-back rates for renewable electricity [21, 22].

As mentioned above, a change in government policy concerning wind energy, leads both to promotion of numerous companies to submit applications for the construction of new wind power plants and to

investigation of potential wind energy sites. In terms of generating electricity from wind, the development of wind energy in Turkey started in 1998 when some wind plants were installed at several locations in the country. By January 1998, the MENR has received 25 BOT and two auto producer (the production of electricity by industrial facilities for their own use in Turkey, based on the Turkish Trade Law, is called “auto production”) type wind energy project proposals. Currently, wind energy projects are concentrated in the Aegean region (21 projects), the Marmara region (15 projects), the Southeast region (3 projects) and the Black Sea region (1 project). The total capacity of these projects is between 1056 and 1184 MW [23]. Up to date, four wind power plants have been installed with a total capacity of about 20.1 MW [24]. It is estimated that 1359 MW of capacity will be installed and put into operation by the year 2005. It is also estimated that the wind energy capacities will be 2979 MW in 2010, 5142 MW in 2015, 7849 MW in 2020 and 11,200 MW in 2025 [23]. In Turkey, plans are going ahead to install 11,200 MW of wind turbines by the year 2025. According to this, the installed wind energy capacity of Turkey would be increased from 300 to 11,200 MW, and the share of wind energy for generating electricity would be increased from 0.5 to 3.55%. On the other hand, recently, small wind turbine systems with capacities ranging from 1.5 to 5 kW have also been installed in some Turkish universities for conducting wind energy investigations as well as for lighting purposes [12, 24 and 25].

4. RESULTS AND CONCLUSION

Wind energy will play an important role in future energy needs. However, the potential sites of wind energy generation of the country have not been completely investigated in detail yet. In order to provide a broad wind resource assessment over Turkey, the wind characteristics must be studied in detail at each site separately. Although there are several companies attempting to establish wind power plants in different districts in Turkey, it cannot be said that the work in this field is satisfactory. Considering the development of wind energy in the country, it may be concluded that the number of wind power plant installations will considerably increase in the future. The strong development of wind energy in Turkey is expected to continue in the coming years.

5. REFERENCES

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