

An Overview of Turkey's Wind Energy Potential and Energy Policy

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Abstract- This paper deals the existing condition of wind energy potential of Turkey and renewable energy policy. Turkey has the serious potential of wind energy. The value of wind energy potential in Turkey was estimated to be 48,000 MW approximately, but current installed power capacity is only 6,872 MW until 2018. This is why large investments have been made in both wind power plants and wind industry in recent years. Currently, Turkey is the most important wind market in Europe with 11 GW current project stock and 20 GW wind energy capacity in 2023 national target. Electricity generation from wind energy will contribute both to the protection of ecological balance and to the economy of the country.

Keywords- *Renewable Energy, Wind Energy, Energy Policy*

I. INTRODUCTION

Energy and the use of energy are the main determinants of the economic, cultural and social development of a country. Energy and energy resources are the most important inputs at the source of society's life and at every stage of life [1]. For this reason, energy sources have caused competition and wars between countries since ancient times.

The need for energy is constantly increasing in the world due to many factors such as technology, industry, the rapidly growing world population, rising standards of life. Although their reserves will be depleted in the short run and lead to serious environmental problems, fossil energy sources are the most preferred sources for many years. Toxic gases that fossil energy sources release into the atmosphere as end-of-combustion products cause global warming. And the research shows that the greenhouse gas emissions that cause global warming are largely due to the energy sector. Because of its damage to the environment and its limited resources, all countries of the world are looking for clean and renewable energy sources and are looking for research in the direction of energy use in the most efficient way. With the development of technology, methods for the most efficient use of renewable energy resources are being developed.

II. STATUS OF RENEWABLE ENERGY IN THE WORLD AND TURKEY

The oil crisis in 1973 revealed the idea that oil-based energy use policy could create danger all over the world and that diversification of resources is necessary. And as a result of this idea, energy production from renewable energy sources has started to spread all over the world since the 1980s.

According to the scenarios, despite the relatively low share of fossil fuels in the period until 2040, these fuels will continue to be dominant sources. It is estimated that the share of nuclear energy in primary energy sources will increase and the share of renewable energy sources in 2040 will be 16.1%. According to the current policies scenario, global electricity demand is expected to increase by an average of 2.3% each year and increase by 80% from its present value by 2040[2]. In order to meet this increase, solar, wind, geothermal, etc. the share of renewable energy sources in energy production needs to be increased.

According to the Republic of Turkey Ministry of Energy and Natural Resources data, renewable energy resources are the energy sources with the fastest growth rate with an average annual growth share of 9.8%. It is thought that nuclear energy will have an average growth rate of 2.3% per year and an average of 1.8% per year. The energy source, which has the highest growth rate among fossil fuels, is natural gas with an annual average growth rate of 1.5%. Natural gas is followed by oil and coal with an annual average growth rate of 0.4% and 0.2%, respectively.

The energy statistics in Figure 1 show that electricity generation based on renewable energy sources such as 33.7% hydraulic, 7.7% wind, 1.1% geothermal, 0.8% biomass and 1.7% solar are realized at 45% in Turkey according to the data of 2017[3]. Most of the remaining 55% share is produced from imported fossil energy sources. This creates both economic and environmental disadvantages. If the production of equipment for renewable energy sources is realized in our country, it will be possible to reverse the ratios in the table and reach a cleaner environment.

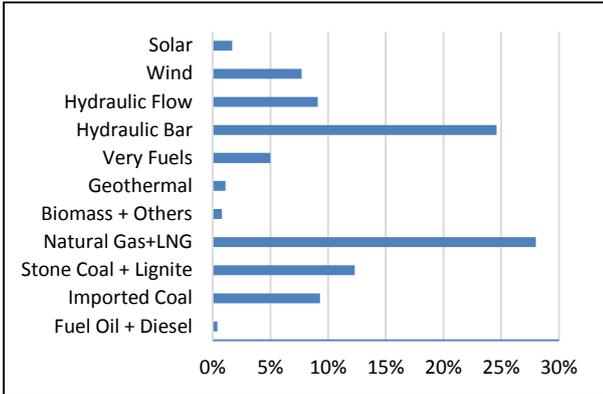


Figure 1. Distribution of Electricity Generation by Sources in Turkey, 2017[3]

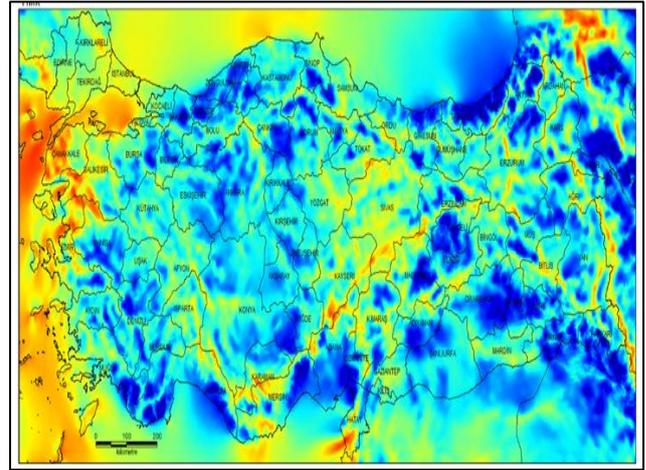


Figure 3. Turkey's annual wind speed map at 50 m altitude [4]

When we look at the distribution of electricity generation in 2017 according to energy sources, 40.6% coal, 4.3% petroleum, 21.6% natural gas, 10.6% nuclear and 22.9% renewable energy sources are used in the world [2].

III. ENERGY POLICY OF TURKEY

Energy policy, determined by the Republic of Turkey Ministry of Energy and Natural Resources, is defined as “to minimize the negative impacts on the environment and human health by using the limited natural resources more rational, diversifying the energy with new technologies in addition to new resources, and to provide cleaner, safer, more efficient, cheaper and more commercially available and sustainable energy supply”. In line with this policy, new investments have been made and the renewable energy installed power increased day by day.

Fig. 3 shows the wind speed map of Turkey which determined by The Wind Energy Potential Atlas of Turkey (REPA) which developed by The General Directorate of Electrical Power Resources [4]. According to this map 5 MW/km² valued wind power plants can be installed in the regions that having higher wind velocity than 7.5 m/s and 50 m above the ground.

According to the map the high wind potential shores generally lay along the Aegean Sea shore, followed by central Black Sea and eastern Mediterranean Sea [5]. The reports from REPA, Turkey's wind energy potential is estimated to be 48 GW that is 120 billion kWh [2]. Moreover, Turkey's offshore wind power potential exceeds 10 GW, that is 22% of the cumulative wind power capacity [5]. However, as a result of the researches and investments, it is estimated that only 3.1 GW of this potential can be used until 2020 [6].

In Fig. 4 it is shown that the development of electricity generation based on wind energy, which we are using a very small fraction of our current potential, according to years. While there were 146,3 MW wind-based power plants in 2007, 6.872,1 MW installed power was reached in 2017[7]. According to current data of the Electricity Affairs Administration, there are 161 licensed and 61 unlicensed wind power plants [8]. Fig. 5 shows the location of these installed wind power plants on the map [7].

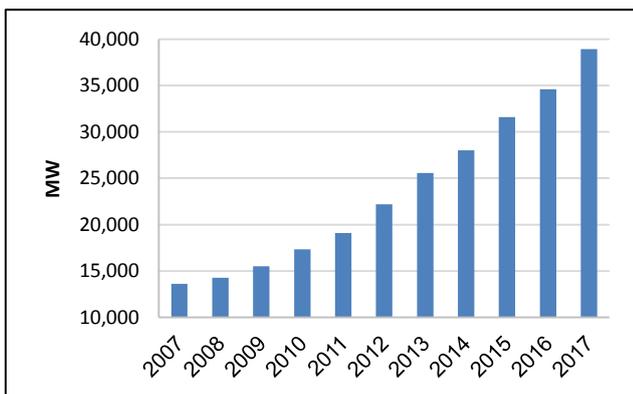


Figure 2. Renewable Energy Installed Power Generation [4]

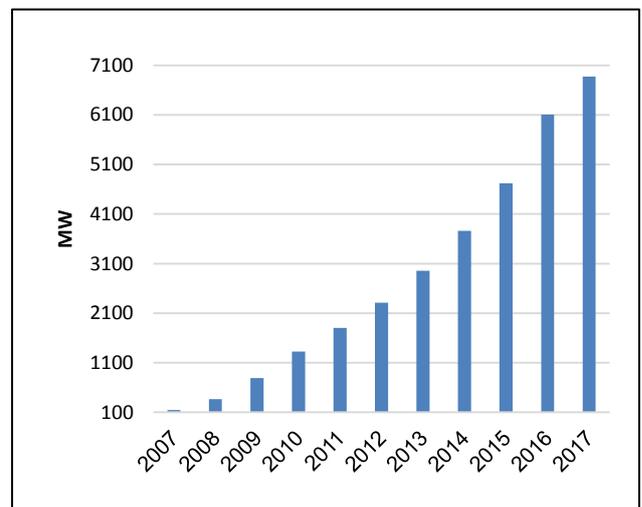


Figure 4. Cumulative Installation for Wind Power Plants In Turkey, 2017 [7]

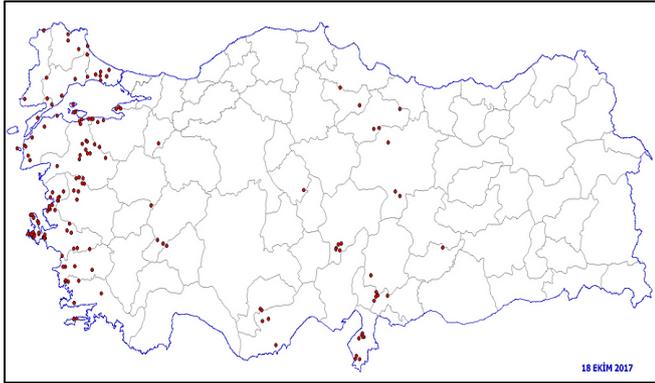


Figure 5. Installed Wind Power Plants On The Map, 2017[7]

IV. CONCLUSION

Turkey is a rich country in terms of renewable energy sources such as wind, solar, geothermal, hydraulic, biomass. Although this situation Turkey meets more than half of its energy needs from imported sources.

The biggest obstacle to the use of clean energy sources is that installation equipment is imported and expensive. Turkey can be able to supply the energy need from clean and cheap renewable energy sources through the production of domestic equipment.

In order to expand the use of renewable energy resources in Turkey, government incentives should be increased, disrupted parts of legislation should be corrected, technological

developments should be followed, domestic equipment production should be encouraged and supported. In this way, safe energy supply will be provided by diversification of resources, great contribution will be made to the country economy and new business opportunities will be born.

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