

Investigation of the Change of Electric Energy Generation Sources in Turkey by Statistical Methods

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Abstract – It is among the most important regions of the development enclosures of the electrical energy state. It is an important economic indicator for countries, as well as a combination of the development indicator, how the clothes are made. Because how much electricity is produced from which source, how efficiently this production efficiency is used gives serious direction to school economic policies. From this situation, it summarizes how the electrical energy produced in Turkey between the years 2011-2020 has changed on a yearly basis, what the production values are and what share it has in the total production from these sources. Ensuring the results achieved, except for the year 2019. In all other years the electric power plant has always been a series compared to the previous year. In addition, from 2011 to 2017, electricity generation from natural gas was always the leader, while after 2017 this situation was caused by coal.

Keywords – Energy Resources, Fossil Fuels, Energy Policy, Türkiye

I. INTRODUCTION

Electric power generation is vital to the functioning of modern societies. Electrical energy is used in many sectors and in all areas of daily life. There are many important aspects of electrical energy production. The first of these is the economic aspect. Electrical energy is a key driver of economic growth and industrialization. Many businesses such as industrial plants, production lines, factories and offices need electrical energy. Electrical energy is also used in many sectors from agriculture to health services, from communication to transportation and plays a critical role in sustaining economic activities. On the other hand, if it is considered in terms of quality of life, electrical energy is a basic requirement in many areas of daily life. Many activities such as lighting, heating/cooling, cooking, water supply, communication, information technologies, entertainment and electrical devices are carried out with electrical energy. Without electrical energy,

the comfort and efficiency of modern life is greatly reduced. In addition, the environmental effects of the resources used in electrical energy production are of great importance in terms of sustainability. Renewable energy sources, especially sources such as solar, wind, hydroelectric and geothermal, provide an environmentally friendly energy production. These resources reduce greenhouse gas emissions and play an important role in tackling climate change. One of the important aspects for countries is undoubtedly energy security. Providing electrical energy production from local sources is important in terms of energy security. An energy portfolio based on a variety of energy sources ensures diversification of energy supply and stabilization of energy supply. This increases the country's energy security and reduces foreign dependency. In addition to these, it has many contributions in terms of innovation and technological developments. Electric power generation encourages the development of innovative technologies. It continuously makes

advances in areas such as renewable energy technologies, energy storage solutions, energy efficiency and smart grids. Electricity generation is of great importance for the reasons mentioned above. Reliable, environmentally friendly and sustainable production of electrical energy is of great importance in terms of both economic development and sustainability. At the same time, increasing investments in energy efficiency and renewable energy sources is a critical element for the future of the energy sector and energy security.

Electricity generation in Turkey is provided from various sources. Among them, hydroelectric energy is one of the most widely used sources so far. Hydroelectric power generation is quite common due to Turkey's large water potential. Dams and hydroelectric power plants generate electricity by converting the kinetic energy of water into electrical energy. One of the most important resources that Turkey uses in energy production is natural gas. Electricity is produced by burning natural gas in gas turbines or gas cycle power plants. There are rich coal reserves in Turkey and coal is used for electricity generation by burning in thermal power plants. However, in recent years, there has been a tendency to decrease in the use of coal due to its environmental effects and policies towards clean energy sources. One of the important energy production sources of our country is wind energy. Turkey's wind potential is quite high. Wind energy is converted into electricity using wind turbines. Wind power plants have been established especially in the Aegean and Marmara regions. Solar energy is also used in energy production. Electric energy is produced by using solar energy panels in regions of Turkey with high sunshine duration. Solar energy is converted from sunlight into electricity through solar panels. Finally, geothermal energy is used in energy production in our country. Turkey is one of the countries with geothermal energy potential. Geothermal resources are used to generate electricity by using hot water and steam underground. In addition, incentives and investments for renewable energy sources have

been increasing in Turkey in recent years. For this reason, the share of clean energy sources such as wind energy, solar energy and geothermal energy is increasing. At the same time, energy efficiency and energy saving measures are taken into consideration and sustainable policies are followed in energy production and consumption. The need for energy resources in the world is growing day by day. Considering the increasing population, industrialization activities and living standards of societies around the world, the need for energy resources is increasing day by day. In this sense, countries develop many policies unique to them in terms of the use and sustainability of these resources, and many of these policies have been researched.

II. MATERIALS AND METHOD

The data used in this study were obtained from the official website of the Turkish Statistical Institute (TUIK). In addition, SPSS and Excel programs were used to analyze the data and create graphics. The variable-based index method was used to calculate the percentage change compared to the previous year. In the variable-based index, the change in the relevant year is always calculated by comparing it to the previous year. While one year is accepted as the starting value in the fixed-based index, there is no fixed year in the variable-based index. It constantly changes from the previous year. The calculation method is given in the formula below.

$$\text{Variable Based Index} = \frac{p_i}{p_{i+1}} \times 100$$

Here;

- pi: the value of the variable in the relevant year
- pi+1: Variable value of the year that comes after the relevant year

III. RESULTS

Figure 1 shows the total electrical energy produced by Turkey between 2011 and 2020 in GWh.

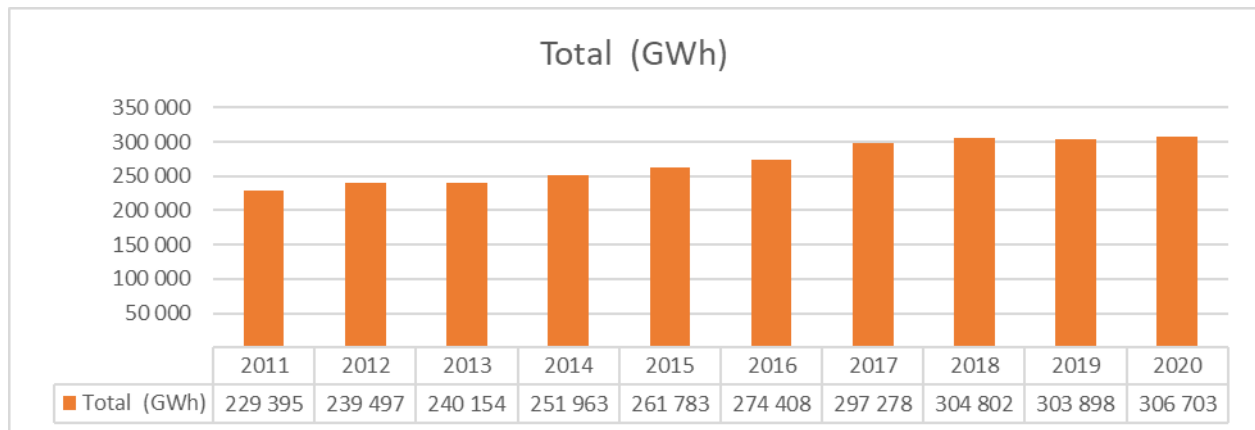


Figure 1: Total electrical energy produced in Turkey between 2011-2020

According to the figure in question, while 229395 GWh was produced in 2011, this value was calculated as 306703 GWh in 2020. While the said productions increased each year compared to the previous year, it was determined that there was a decrease in production only in 2019 compared to

2018. While 304802 GWh was produced in 2018, this number was calculated as 303898 GWh in 2019. When the relevant years are evaluated in general, it is seen that there is an increase of approximately 34% in 2020 compared to 2011.

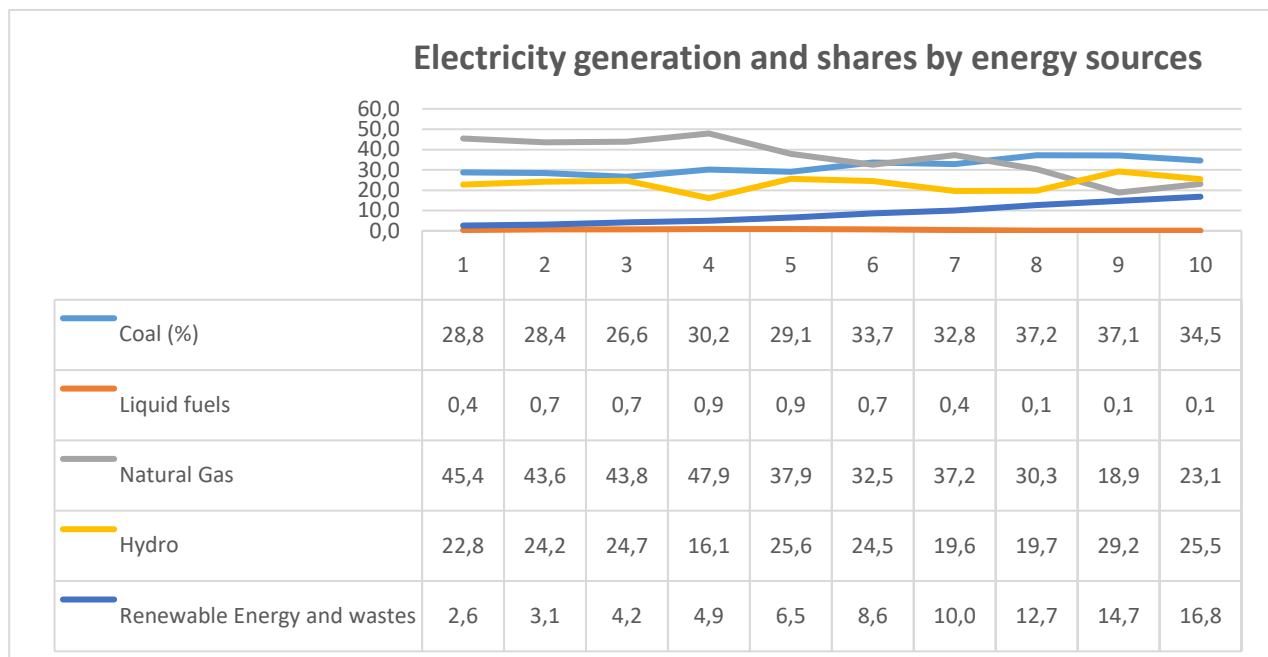


Figure 2: Distribution rates of generation resources of total electricity produced in Turkey between 2011-2020

Figure 2 shows the percentage values of the year-based resource providers of the total electrical energy produced in Turkey between the years 2011-2020. It is seen in the figure that electrical energy is produced from 5 different sources. These resources are renewable energy and waste, coal, liquid fuels, natural gas and hydro energy. Approximately 29% of the total electricity produced in 2011 was obtained from coal, while 45.4% was obtained from natural gas. It was

determined that the lowest production source was liquid fuels with a rate of 0.4%. By 2020, these rates are seen as 34.5% for coal, 0.1% for liquid fuels, 23.1% for natural gas, 25.5% for hydro energy, and 16.8% for renewable energy and waste. The percentages of the total production of other years in the production are clearly seen in Figure 2.

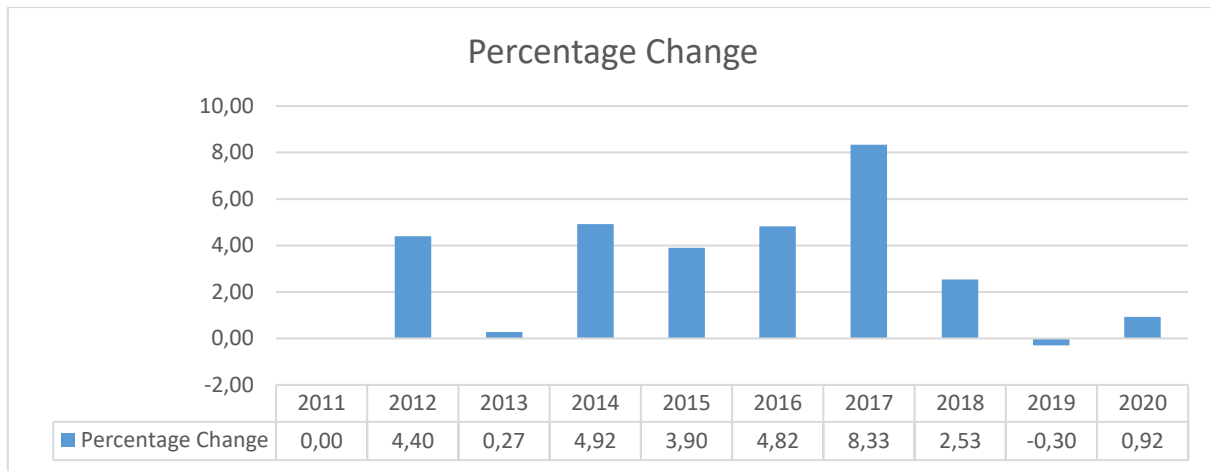


Figure 3: Percentage Change of Electricity Production Amounts Compared to the Previous Year

Figure 3 shows the percentage graph of how the electrical energy produced between 2011 and 2020 has changed compared to the previous year, with the year 2011 as fixed. According to the graph, the highest change was in 2018 with 8.33%, while the least change was in 2019 with -0.3%. Changes for other years are clearly given in the related chart.

IV. CONCLUSION

In this study, the total value of the electrical energy produced in Turkey between the years 2011-2020 and the fundamental changes in how the main sources of these productions are distributed are shown. According to the results of the analysis, it is seen that there is an increase in the total electrical energy produced in Turkey between the years 2011-2020 compared to the previous year in all other years except 2019. There was only a slight decrease in 2019 compared to 2018. When this decrease is evaluated on a proportional basis, it is 0.30%. In addition, the highest increase on a percentage basis within the relevant 10 years was observed during the transition from 2016 to 2017. The said rate was calculated as 8.33%. As a result, it is seen that there is no stability in electrical energy production between 2011-2020. While the said production showed serious increases in some years, it showed serious decreases in some years. The main reasons for these increases and decreases need to be investigated in detail. If it is determined that these changes are out of control, it will be beneficial for our country to identify the problematic parts and take urgent measures.

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