Chapter 3

International Energy Strategy and Dependence on Foreign Energy in Turkey

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Abstract

Energy resources are one of the most important inputs that feed technology to lead the progress and development of countries. Various studies show that domestic resources not only reduce foreign dependency but also make the country more energy-efficient in terms of economic and social perspectives. This chapter discusses Turkey's strategies based on energy resources and focused on the domestic energy resources in Turkey despite the increasing energy demand due to urbanization, increased population, and structural changes in the country. Turkey's dependency on energy resources has been increasing and strategies to ensure the energy efficiency of Turkey are highlighted. Turkey can reduce its dependence on foreign sources while increasing its energy supply security by increasing its resource diversity in the coming years, and it is necessary to evaluate its high renewable energy (wind, solar, biomass, hydraulic) potential.

Keywords: Energy resources of Turkey, Energy demand, Energy strategies, Imported energy resources, Foreign energy dependence

3.1. Introduction

In the 21st century, energy is one of the most important inputs in economies in the world. Increasing trends in world population, economic growth, urbanization, and technological developments have increased the energy needs of countries therefore, energy as the basic input for the economies gained high dynamism. However, energy resources are unevenly distributed around the world and the uneven distribution of energy resources causes many countries to trade foreign energy. Due to its stated importance, the main area of political turmoil and hot wars are in the regions where energy resources are concentrated. However, in recent years, world economies are faced important problems in energy markets. The foremost of these problems is the dependency of countries on foreign energy resources. Foreign dependency on energy resources is an important problem not only from an economic point of view but also from a political point of view. The supply of energy resources from foreign sources can also lead to a national security weakness, therefore energy resources are an extremely important element of domestic and foreign policies of countries. Empirical studies show that energy resources are closely related to the economic, social, and environmental dimensions of sustainable development (Hamilton, 1983; Burbridge & Harrison, 1984; Barro, 1990; Lucas, 1988). The relationship between energy and economic growth brings up the existence of two basic views in the literature (Ghali & El-Sakka, 2004). According to the pro-energy view, which argues that energy is used as an important input in addition to basic factors such as labor and capital; energy is a substitute for labor in the technological process. According to the neoclassical approach, which is the other view, there is a claim that energy costs do not have any impact on economic growth since they have a very small share in GDP. However, Stern and Kander (2011) suggest that the growth of energy use and energy augmenting technological change are the main sources of growth in the 19th and early 20th centuries.

Turkey is a big country in terms of primary energy resources. Turkey occupies a geostrategic position between the countries in the region with three-quarters of proven oil and natural gas reserves and consumer markets in Europe. This privileged natural bridge position provides Turkey with opportunities in terms of energy security and also imposes responsibilities. Despite its high primary energy

potential, Turkey experiences energy shortages, and thus, the energy demand of the Turkish economy is met from a limited number of sources and a small number of countries. This situation is seen as an element of weakness in terms of bottlenecks that may occur in the future. Its high population in the young generation and rapidly developing industry sector and increasing urbanization rate cause a rapid increase in energy consumption in Turkey. Because of all reasons stated above, Turkey needs to focus on areas with the potential, to meet the increasing energy demand, and in this way, the increase in energy production will be directly effective in reducing foreign energy dependency at the same time.

The sections below highlight the issues of Turkey in terms of shortages of energy resources, domestic supply of energy and demand for energy resources, and energy for final demand. However, the importance of renewable sources and Turkey's targets to increase the use of natural resources are discussed in the following section, followed by foreign strategies towards foreign energy dependency. The final part is the conclusion which suggests what should be done to increase the efficiency of energy resources so that Turkey's final demand on energy is mainly met by the domestic resources decreasing the foreign energy dependency in the future.

3.2. Domestic energy supply and demand and import dependency

Energy consumption, which has an indispensable place in our daily life is becoming more important day by day. Through the use of energy, societies can produce more goods and services, to meet their needs and raise their living standards. As in the basis of industrialization, the fact that there is always a need for energy resources in determining costs, achieving economic growth, and continuation of technology in production shows the importance of the country's energy supply. Although the energy need is increasing, the exhaustion of some energy resources, the dependency on foreign energy resources, and the existence of environmental or ecological effects in production carry the energy issue to a more important and sensitive position in Turkey. To address these issues above, Turkey's domestic energy resources, state of energy production, and current energy demand are highlighted in the following sections.

3.2.1. Energy resources and Turkey's energy demand

Energy, which is the main input and driving force of economic activities is one of the most important determinants of economic and social welfare (De Miguel et al., 2003; Fischer & Springborn, 2011; Heutel, 2012; Manzoor et al., 2012) studied the cost-efficiency and environmental effects of implementing renewable energy use, while Inglesi-Lotz (2016) suggests that increasing the share of renewable energy use positively affects economic growth. The development of an economy and the sustainability of this development depends on the sufficient amount of energy resources and the energy whether it is the primary or secondary source to be supplied at the least cost by the methods that do not harm the environment. The state of energy that has not undergone any change or transformation is called "primary energy". Petroleum, hard coal, lignite, natural gas, hydraulic and geothermal energy, wind energy, the energy obtained from tides and waves in the seas, nuclear energy, solar energy, wood, animal, and plant wastes are the main primary energy sources. The types of energy obtained by the conversion of energies in the form of primary or secondary energy are called "secondary energy". Electricity, coke, coal gas, and liquefied petroleum gas (LPG) are the main types of secondary energy.

Turkey has been the country with the fastest increase in energy demand within the Organization for Economic Cooperation and Development (OECD) countries for the last twenty years and, Turkey ranks the second country in the world after China with increasingly high electricity and natural gas demand. However, the issue of dependence on energy resources has become a serious hindrance for the Turkish economy in the past and as a result of the rapidly increasing energy demand, Turkey's dependence on imported energy resources especially on natural gas and petroleum products is increasing. As shown in Table 3.1, Turkey's main imported energy resources are natural gas, coal, crude oil, and petroleum products. Primary energy resources are insufficient to meet the demand due to the change in the demographic structure, and the increase in energy demand parallel to the development of the industry.

Turkey has significant advantages in renewable energy resources due to its geographical location. However, renewable energy sources (wind, solar, geothermal, and biological) are not used enough in terms of current technological opportunities. In this respect, the energy deficit is met through imports (Al-Iriani,

2006) demonstrated that cheap energy resources are the main determinants of economic growth. If Turkey increases the use of its domestic energy resources by implementing more projects this could increase the supply of renewable energy resources and thus reduce the foreign energy demand. According to the Turkish Energy Efficiency Strategy Report (2012-2023), with rational policies and technological improvements, energy efficiency between 2013 and 2023 is expected to increase by at least 20 percent. However, according to (Kaygusuz, 2007; Kaygusuz et al., 2007) promoting renewable energies not only further modernize the energy sector but also supports the various countries' goals for economic development and sustainability.

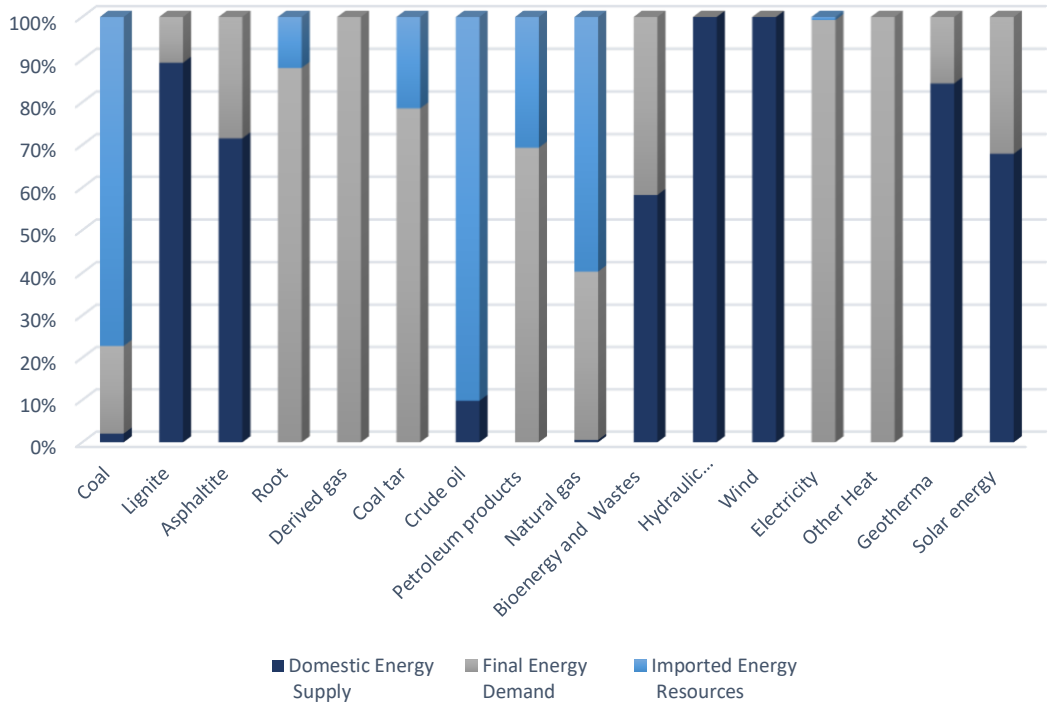
Table 3.1. Turkey's Energy Resource Supply

	Domestic production	**Import (-)**	**Export (+)**	**Other external source (*ikrakiye*) (-)**	**Inventory change (+/-)**	***Supply of Energy Resources***
Coal	1065.6	40106.2	142.6		-102.1	***40927.1***
Lignite	71637.4		4.0		-1478.6	***70154.8***
Asphaltite	2008.5				92.8	***2101.3***
Root		669.5	3.4		55.1	***721.2***
Derived gas						***0.0***
Coal tar		9.7	150.3		22.9	***-117.7***
Crude oil	3202.9	29369.4			182.8	***32755.1***
Petroleum products (Thousands of Tons)		18247.2	7729.7	2366.6	62.7	***8213.6***
Natural gas (106Sm3)	457.8	48125.5	577.5		243.4	***48249.3***
Bioenergy and Wastes (Thousands of Tons)	11925.6					***11925.6***
Hydraulic (GWh)	78094.4					***78094.4***
Wind (GWh)	24828.2					***24828.2***
Electricity (GWh)		1889.5	2483.6			***-594.1***
Other Heat (Thousands Tp)						***0.0***
Geotherma (Thousands	10576.1					***10576.1***

Tp)		
Solar energy (Thousands Tp)	1784.0	***1784.0***

Source: International Energy Agency (IEA)

According to the International Energy Agency, IEA (2020), approximately 67 percent of the domestic demand for natural gas, 44 percent of domestic demand for petroleum products, and 27 percent of the domestic coal demand are met by the foreign/imported resources in Turkey, (Figure 3.1). IEA report also shows that electricity and heat production under the cycle and energy sector was recorded as 306703,09171 GWh in 2020 and this figure meets the electricity demand. However, with an 83.6 million population Turkey's energy consumption per person is 1.76 (tep/h) while electricity consumption per head is 3.661 kWh/h. It is expected that Turkey will continue to be one of the most dynamic energy economies in the world in terms of an increase in energy demand in line with its economic and social development targets.



Source: Author's creation based on Energy data in Turkey

Figure 1.1. Turkey's Energy Demand and Supply by Sector

On the other hand, the International Energy Agency report states that the total final energy demand and total primary energy demand have increased nearly twofold by 2020, reaching the level of 170.3 and 222.4 MTEP, respectively, and electricity, natural gas, and oil demand have reached 398 and 434 billion kWh, respectively. It is expected to reach the levels of 59 billion cubic meters and 59 million tons. Table 3.2 lists the final energy demand in Turkey by sector. Based on the information provided in the table, the biggest sector, the industry, demands electricity the most.

Table 3.2 Turkey's Final Energy Demand by Sectors in 2020

	Industrial	**Transportation**	**Other sectors**	**Other demand except energy**	***Discrepancy***	***Final Demand***
Coal	5756.0	0.0	4911.9		*101.3*	***10769.1***
Lignite	4375.9	0.0	4025.0		*218.4*	***8619.3***
Asphaltite	552.0	0.0	246.7		*0.0*	***798.7***
Root	4699.6	0.0	0.0		*231.0*	***4930.6***
Derived gas	499.6	0.0	0.0		*0.0*	***499.6***
Coal tar	18.1	0.0	0.0		*17.5*	***35.6***
Crude oil	0.0	0.0			*0.0*	***0.0***
Petroleum products	4621.5	25239.7	4006.5	6970.4	*415.0*	***41253.2***
Natural gas	10965.7	257.5	20015.6	789.7	*0.0*	***32028.5***
Bioenergy and Wastes	2680.6	141.2	5717.7		*0.0*	***8539.5***
Hydraulic	0.0	0.0			*0.0*	***0.0***
Wind	0.0	0.0			*0.0*	***0.0***
Electricity	119369.8	1525.0	137679.3		*0.0*	***258574.1***
Other Heat	2602.7	0.0	45.5		*0.0*	***2648.2***
Geotherma	0.0	0.0	1954.2		*0.0*	***1954.2***
Solar energy	294.8	0.0	547.7		*0.0*	***842.5***

Source: International Energy Agency (IEA)

3.2.2. Importance of renewable energy sources

In general, renewable energy is a non-fossil source (coal, petroleum, and carbon derivative), which can be supplied mostly on earth in nature without the need for any production process. Renewable energy sources have a low level of CO2 emission when generating electricity and its harm and impact on the environment is much less than the conventional energy sources (Kander, 2002; Tahvonen & Salo, 2001). The high cost of acquiring renewable energy, the difficulty in storing the energy obtained from the sources, and the limited renewable energy infrastructure prevent the widespread use of renewable energy in the world. As global warming started to show itself more significantly in Europe, Southeast Asia, and Turkey, the need for renewable energy sources increased even more. European countries have gradually reduced the share of environmentally harmful sources in energy consumption and their energy policies aim the withdrawal of non-renewable energy resources to the zero point. In Turkey, renewable energy sources have only a 10% share in the consumption of energy resources. However, the common opinion of experts working on renewable energy sources is that Turkey's current potential is more. Turkey ranks second in Europe after Norway in hydroelectric energy potential and despite its potential hydroelectric power, Turkey can only use 41.3% of its resources. However, Turkey also has a very high potential in terms of wind energy, and due to the geography where Turkey is located, it also has a very high potential in solar energy.

Meeting the increasing domestic energy resources demand in production as well as demand for final energy use reveals the need for large amounts of investment in all three areas (hydroelectric energy, wind energy, and solar energy), and therefore, projects should be developed and necessary investments should be made by making use of domestic energy resources. Although Turkey is very rich in renewable energy resources such as solar, wind, and geothermal, the use of these resources is not realized to the extent required, and for that reason, Turkey took some important steps to explore energy from its sources.

After the introduction of domestic coal resources into the economy, Turkey's first drilling vessel is expected to increase Turkey's domestic energy production with positive results from oil and gas exploration activities in the Mediterranean and the Black Sea, thus reducing dependence on the outside. However, the “Renewable Energy Resource Areas” projects in the field of renewable energy, such

as solar and wind, it is expected to attract the world's major investors to Turkey by ensuring that the global trend in renewable energy can increase Turkey's installed power with domestic resources. Renewable energy is considered to be in synergy with many aspects of sustainable development according to Stigllitz (2002) and Bugaje (2006). Therefore, sustainable development through renewable energy resources is at the center of policies all over the world. The strategic position which is another important determinant of sustainable development can make Turkey a trade center in the energy sector which can enable Turkey to use energy at the least cost and more efficiently.

3.3. Turkey's foreign energy resource strategies

The processes in the field of energy all over the world, force governments to carry out comprehensive national and international programs, policies, and strategies to increase energy production and efficiency. This section discusses Turkey's foreign energy strategies for reducing foreign energy dependency to increase energy efficiency. Turkey is one of the countries that are highly dependent on Russia, especially in terms of natural gas. Turkey imports approximately 60 percent of its natural gas from Russia. However, Turkey is Russia's largest natural gas customer in Europe after Germany and the high dependency on natural gas in electricity generation limits Turkey's bargaining power against Russia (Yilmaz, 2014).

For energy security and reliability, it is necessary to increase energy production together with the energy supply rate to meet the increasing energy demand. On the other hand, due to a lack of planning and wrong energy policies, energy production was not given the necessary importance and thus, an insufficient amount of domestic energy resources despite the increasing energy demand increased Turkey's foreign dependency on foreign energy resources. Energy security is a term that has become very popular in recent years. With the decrease in the world's energy reserves, the issue of energy security has become more important than ever. Therefore, the main reason why The North Atlantic Treaty Organization's (NATO) focus on energy security in recent years is one of the reasons for this situation. There are different definitions of the concept of energy security:

1. Consistently reliable, clean, and appropriate amounts of energy from

various sources/countries and providing them at affordable prices and consuming them with high efficiency.

2. Access to sufficient amounts of energy resources from a stable source, at a consistent price through transport that is not threatened (pipeline, suitable sea routes, etc.) within the framework of fair distribution.
3. Intelligent use of the world's energy.
4. Continuous availability of energy services that the economy needs.

As the current account deficit widens, Turkey extended its domestic and foreign energy strategies in recent years. According to the Ministry of Energy and Natural Resources in Turkey, ensuring route and resource diversification to strengthen energy supply security is one of the main objectives of Turkey's energy strategy. However, Turkey aims to become Europe's fourth main artery for natural gas after Russia, Norway, and Algeria, by making attempts to take the role of a reliable transit country between producer and consumer countries in the East-West and North-South axes. However, Turkey's authorities plan to focus on the regional and global energy security issues so that Turkey becomes a regional trade center in energy. Turkey's energy strategies should consider how foreign dependency on energy is decreased despite the increasing energy demand and, ensure diversification of new routes and resources in the supply of oil and natural gas. To become a regional trade center in energy, Turkey's strategies should also consider a contribution to regional and energy security. While implementing the new strategies at each stage, social and environmental impacts on the energy chain as part of sustainable development should be examined. However, energy generation consumes too much energy, and to decrease the consumption, strategies should consider how to increase the share of renewable energy in domestic electricity generation.

Besides the domestic energy strategies, Turkey's security strategies which started beyond its borders have come to the fore in the world in recent years and Turkey's strategic transit routes and being at the center of many important economic and political geographies are extremely important in terms of energy security. Within the framework of its multidimensional energy strategy, Turkey aims to diversify the source country and route to increase the share of renewable energy in the energy mix, using nuclear energy, aims to increase energy efficiency and to contribute to the energy security of Europe at the same time.

3.4. Conclusion

Although Turkey has great potential in terms of primary energy sources, this potential is being used insufficiently. Turkey's foreign energy dependency ratio is around 70 percent according to International Energy Agency (IEA). To reduce the foreign dependency ratio in energy, Turkey should focus on areas with potential before choosing whether to use fossil resources, renewable resources such as wind and solar, or nuclear energy. In this way, the increase in energy production will be directly effective in reducing foreign dependency. Turkey needs to take serious steps to produce strategies to be an important factor in energy Firstly, energy, which is one of the important inputs of the economy, must be provided uninterruptedly to ensure energy security and to sustain economic development. However, Turkey needs to do a feasibility analysis to determine the future of energy demand in line with structural development in economic sectors, take into account the change and transformation in those sectors and evaluate the opportunities that arise to increase efficient use of energy resources.

However, economic policies should be oriented towards providing cheap energy resources to keep prices low and affordable. For example, different tariff rates can be implemented based on a low-income group of population and energy demand during the off-peak and peak hours. The establishment of policies and strategies will ensure the security and continuity of energy supply and accessibility and will ensure and strengthen security by keeping energy areas under control.

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