

Use of Energy Resources as an Element of Energy Policy in South Korea, Japan and Turkey

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Abstract

While the experience of the 1970s has led to the discovery of the economics of energy, we can also say that countries have made radical changes in energy policies. After two oil crises in the 1970s, countries have sought to utilize alternative energy resources and to diversify their primary energy supply. The aim was to protect their own countries' industries and to ensure the security of primary energy supply from the impact of sudden oil price increases. In recent years, diversification of resources has taken the environmental impacts of alternative sources of oil into account. In this context, renewable energy resources have been increasingly utilized. In addition to the water power used to obtain energy for many years, wind and solar energy, geothermal energy and biomass energy have also been utilized. Thus, an important element of the energy policy in the world has turned to utilize alternative energy sources by reducing dependence on oil. For this purpose, it is important to reduce the dependency on fossil fuels such as oil, which can be consumed in other reserves. However, in addition to renewable energy sources, the utilization of natural gas and nuclear power plants has continued at an accelerating rate. South Korea and Japan have given importance to nuclear power plants. Although Turkey has tried to diversify sources of energy supply after the oil crisis of the 1970s, the heavy-dependancy on imported fossil fuels still lasts. As Turkey began to turn to natural gas -another fossil fuels- instead of oil, the dependence on natural oil increases, while dependency on oil decreases. With the changes in energy policies in Turkey since the 2000s, it has begun to shift to renewable energy sources and the establishment of nuclear power plants.

Keywords: Oil, Oil crisis, Natural gas, Primary energy supply, Primary energy demand, Energy use.

Introduction

When we look at the history of energy, we see that the first people benefit from fire in lighting and heating. As agricultural activities and animal husbandry began about 10,000 years ago, people began to plant agricultural products for themselves and their animals. As more energy needs arise, people began to build new machinery and equipment. First, they have built millers to benefit from water-floated vehicles and water power for transporting agricultural products that were raised more than needed. For example, in 1086 England 5,624 mill was determined, the number of France in 1700 for the number of 100,000 was understood to have found. (Ausubel, 2000: 1)

In the year of 1000, inefficient use of energy has brought with huge costs. For example, prior to the discovery of the chimney system, in houses, a fire was lit in the middle of the room and the roof was made high to prevent smoke from causing problems and woods were used to draw the smoke. Although a lot of wood was used to obtain fire during this period, in 1744, with the discovery of the stove, the amount of wood needed to burn the stove and keep the fire continued decreased. In the 1800's, coal was a new source of energy, and until the discovery of oil, it became a dominant source of energy. With the introduction of coal as a source of energy in the 1800s, cities began to develop and social structure in cities began to become complicated. Throughout the 1800s, population density has increased in the UK industrial zones, and energy use per capita has slowly increased. Until the 1900's, coal remained a dominant source of energy, but air pollution has emerged in cities and the lives of miners have been adversely affected. In 1900, liquid fuel was superior to solid fuels. Oil has more energy density than coal. In other words, it is possible to gain more energy than the same amount of oil and the same amount of coal. It is possible to transport oil through pipelines or tankers. It is easier to store and use. Therefore, it has been the dominant energy source since 1950. Natural gas has superior properties that can compete with petroleum as an energy source that can be stored as petroleum and transported through pipelines. (Ausubel, 2000: 1-2)

Energy consumption in the world has increased rapidly in parallel with economic growth and population growth since the 1950s, and consumption rate of consumption has slowed down and changes in resource utilization have occurred in the two oil crises in the 1970s. (Bahar, 2005: 38)

Nuclear power is a more efficient source of energy than petroleum and natural gas. In general, research has concluded that nuclear power plants produce more expensive electricity than coal power plants, and have a better economic performance than wind and solar energy near natural gas power plants. However, the greatest benefit of nuclear power plants is its positive contribution to diversification of energy resources and energy supply security. While fluctuations in prices of coal, oil and natural gas affect energy production cost too much, fluctuations in uranium prices do not affect energy production cost too much. Nuclear energy is a renewable energy source that can be used to generate electricity from renewable energy sources such as coal, coal, and natural gas. (Köksal and Civan, 2009: 1-2)

The first installation costs of nuclear power plants are high and operating costs are higher than other plants. Therefore, it is important to operate until the economic life is completed. In fact, despite the recent nuclear power plant accidents, the construction of nuclear power plant continues throughout the world. In this study, the countries we will discuss in Japan as a result of the 2011 earthquake in spite of nuclear power plant failures, the construction of new power plant continues, South Korea also plans to build new power plant construction is carried out. Turkey has planned to install two nuclear power plants and started construction of the first Mersin-Akkuyu Power Plant. (World Nuclear Association) In brief, let's examine the policies on the use of energy resources in the three countries.

1. South Korea

The oligopoly markets have dominated South Korea since the 1880s. Cheabols, few companies that still dominate the market today. Cheabol is a company that grows and manufactures in many areas through horizontal expansion, whether or not related to each other, (Amsden, 1989: 141-155) Economic policy has been based on the export led growth strategy

since 1963 for with labour power that is abundant and cheap. Therefore after this date, high economic growth rates could be achieved (Eski, 1989: 142-143). During the first (1962-1966) and second plan (1967-1971) periods, priority was given to the development of labour intensive industries, and the necessary technology and capital directly imported by these industries. (Eski, 1989: 16-19) The export-oriented industrialization process was started with the export of textile products in the 1960s. (Amsden, 1989: 55-73) Import substitution industrialization strategy was returned in 1972. (Leipziger, 1988: 124-125) However, the necessity of making exports has not been forgotten, some sectors continued to support for export. (Dolanay, 2017) Heavy industry, chemical, iron and steel, metal, Petro-chemical, electronic and shipbuilding industries are planned to be supported with an import substitution policy and heavy industry, chemical industry and agricultural investments are emphasized. The policy of supporting selected markets was adopted in the post 1980 period. (Leipziger, 1988: 124-125) Therefore, the export-oriented growth model has been returned. (Dolanay, 2017) Goods produced in cotton, textile and electronics industries were began to export after the year 1976. GDP increased by an average annual rate of 8.8%. While GDP growth rate was 9.43%, energy consumption growth rate was 9.11% during the period between 1965 and 1973. Average annual, GDP growth rate was 9.44%, energy consumption growth rate was 8.76% between 1973 and 1979. GDP growth rate remained at 0.4% on average during the period between 1965 and 1979. (Yager, 1984: 28)

GDP grew rapidly and consistently during the period 1963-1979. It has been observed that the two oil crises did not affect the economic development process of South Korea. (Dolanay, 1998; Dolanay and Uğur, 2009)

GDP increased faster than total energy use in the period 1961-1979 and in 1979, approximately 12.5% less energy consumption per unit GDP was required (Yager, 1984: 28). Energy use increased only 0.9%, while GDP growth rate was at a high level of 8.8% In 1974, in the first oil crisis. The use of energy have not been sacrificed In 1979, In the years of second oil crisis. Since GDP growth rate remained low in this year, the crisis had no impact on the economy. (Yager, 1984: 27-34)

Because of the GDP growth rate stayed fewer, there was no effects of crisis on economy and energy use figures in 1979 (the year of second oil crisis).

Use of domestic coal production and imported oil increased continuously until 1973. Compared to 1973, coal production increased approximately 34% in 1979, while oil imports increase rate decreased. GDP has grown very rapidly and energy needs have been met by non-oil sources. Thus, dependence on imported oil is reduced. (Dolanay, 1998: 65; Dolanay and Uğur, 2009)

With the oil crisis of 1973-74, the state continued to implement economic policies that would provide high economic growth rates. In the years of the 1979 crisis, production decreased only in 1980, and in 1981, after these years high growth rates were restored. South Korea could not reflect the increase of oil prices in the prices of export products as in 1974 due to the decrease in competitiveness during the 1979 crisis. A plan was introduced to reduce energy dependence and

to develop alternative energy resources to reduce oil dependence in 1979. From the 1980s, South Korea seems to have risen to the class of industrialized countries. (Yager, 1984: 68-70)

The first activities to utilize nuclear energy in South Korea started with the establishment of the International Atomic Energy Agency in 1957, the Atomic Energy Law was adopted in 1959 and the Atomic Energy Bureau was established in 1959 by the government. The first nuclear reactor in the form of a small research unit was implemented in 1962. The Westinghouse unit of Kori1, the first nuclear power plant, was built in 1977 and commenced operation in 1978. In the early 1980s, construction of 8 new reactors has been continued. (World Nuclear Association) Thus, we can say that the South Korean economy, which maintained its rapid economic growth in the 1970s, continued its rapid economic growth in the 1980s (Dolanay, 2017) by taking advantage of nuclear energy.

The economic growth rate was 5% and the unemployment rate was 3.2% in 2007. When we look at the sectoral breakdown of GDP in 2007; the share of agriculture is 3%, the share of industry is 39.4% and the share of services are 57.6%. These figures also point us to the economic structure of a typical industrial society. (Korea National Institute of Statistics, 2008)

As of 2015, 38.1% of the primary energy supply was provided by petroleum, 15.2% by LNG, 27.7% by biomass energy, 12.1% by nuclear power, 2% by anthracite and 4.9% by water power. From 1980 to 2015, import oil dependency fell from about 60% to 40%. (KEEI (Korea Energy Economics Institute, 2016: 6 and 9)

As of 2015, GDP growth rate was 2.6% and energy consumption growth rate was 2.2%. Thus, in 2015, the economic growth rate was higher than the energy consumption growth rate and energy efficiency increased. The same trend was observed throughout the whole period between 1981 and 2015. KEEI (KEEI, 2016: 9)

Currently, 24 nuclear energy reactors are operating in South Korea with an installed capacity of 22,505 MWe and the construction of 5 new reactors with an installed capacity of 7000 MWe is still in progress. The construction of Shin Kori 6 started in September 2018 (World Nuclear Association, 2018: 4-5). Although nuclear reactors in were damaged South Korea during the earthquake in Japan in 2011, nuclear reactor construction continued. This shows that nuclear energy is a necessity for South Korea.

2. Japan

Japan completed its industrialization in the period between 1868 and 1967 and became an industrialized country in 1967. In Japan, which had become a less developed agricultural country in the 1870s, manufacturing could only be carried out in small enterprises and there was no mass production. (Sadıklar, 1971: 35). The government maintained its protective policy towards industrial enterprises from 1868 to 1905. (Sadıklar, 1971: 35) Mass production of industrial goods in the economy has become widespread in the period between 1905 and 1930. In this period industrialization process, the weight of industry in the economy has increased and the relative importance of agricultural sector has decreased. Rapid economic growth has been seen in the years between 1931 and 1938, destruction has been seen during the years between 1939 and 1944

due to the Second World War. After the decrease in industrial production accelerated, agriculture has become the basic sector in economy (Sadıklar, 1971: 35-39). Industrial production in 1946 fell to 1/7 of the production in 1941 (Sadıklar, 1971: 195).

The US occupation administration has implemented land and education reform, and a free market economy has begun to be created. The entry into force of the 1952 peace treaty, coupled with the emergence of effects of reforms, and a new era has begun for Japan (Sadıklar, 1971: 7-8 and 35-39).

The Korean War has been instrumental in achieving high growth rates in Japan (Tsuru, 1993: 56-59). In the following years, rapid economic growth continued and the average annual economic growth rate in the period between 1953 and 1960 was 9.5% (Sadıklar, 1971: 39-51). The average annual economic growth rate was 7% in the period 1954-1958, 10.8% in the period between 1959 and 1963 and 10.9% in the period 1964-1968 (Tsuru, 1993: 67). Although the Japanese economy, was brought into a very bad situation after the Second World War, it recovered in a very short time and took its place among the developed countries with its high real economic growth rates (Horika, 1994: 293-316).

The average annual economic growth rate was 10.1% between 1967 and 1971. (Sadıklar, 1971: 51-54). The average annual real GDP growth rate was 9,6% in the period between 1970 and 1974. However, there was no economic growth in 1974 with the start of the 1973 oil crisis. (Sadıklar, 1971: 51-54; Dolanay and Uğur, 2018). The low rate of population growth in the Japanese economy in the period between 1960 and 1970 over the years was realized with high economic growth rates. In 1979, GDP increased by about 3.5 times compared the level of 1960 and population growth rate was stay at 1.1% on average (Sadıklar, 1971: 35-51).

In the period between 1960 and 1979, there has been rapid industrialization. The share of agriculture, forestry and fisheries in GDP decreased from 14.3% in 1960 to 4.4% in 1979 and the share of manufacturing industry increased from 26.8% to 34.7% (Yager, 1984: 6). Energy consumption per capita increased by 3.5 times in 1979 compared to 1960. (Yager, 1984: 8)

Energy consumption growth rate did not fall below the GDP growth rate in 1962, 1965 and 1971. In 1974 and especially in 1975, energy consumption decreased compared to the previous year. The decline in energy intensity showed that energy efficiency increased in the period 1974-1979. In the 1960-1973 period, energy intensity tended to increase. In the 1960-1973 period, GDP increased by 10.5% on average and energy consumption increased by 11.8%. In the period 1973-1979, the GDP growth rate increased by 4% and energy consumption increased by 0.6% (Yager, 1984: 8). In the 1960-1979 period, population, GDP and energy consumption increased by an average of 1.15%, 8.39% and 8.36% per annum (Dolanay, 1998: 78; Dolanay and Uğur, 2018).

From 1960 to 1973, Japan's total energy consumption increased more than four times, and its annual energy consumption increase was over 10%. Since domestic energy production is not at a level to meet the energy demand, the import of coal and oil, the primary energy sources from abroad, has been adopted. However, despite the large amount of coal imports, the share of coal in primary energy supply in 1973 remained at 6%, with oil predominantly in the primary energy supply. (Yager, 1984: 15)

Increase in energy intensity accelerated the transition from coal to oil in the 1960-1973 period. Coal could not compete with oil, which is cheap and clean, which can be produced in higher quantities. Real energy prices decreased by 26.6% in the 1960-1973 period. Thus, industrial sector grew by 340% in the 1960-1973 period. In the same period, the share of the industrial sector in total energy consumption increased from 42.5% to 45.7%, and the energy density in the industrial sector increased. Most of the energy use in the industrial sector originates from the manufacturing industry sector. (Yager, 1984: 9-15)

The share of the imported fuel was 90% and the share of imported oil was 77.6% from the total primary energy supply in 1973 (Yager, 1984: 11)

During the first oil crisis in 1973 and 1974; energy savings were made, cement production and steel industry began to use fuel-reducing techniques along with energy savings. Wage increases have been blocked due to the self-specificity of worker-employer relations, priority was given to higher value-added industrial product investments, machinery, electronics and computer production was increased, while heavy industry and chemical industry investments were reduced due to high cost, Measures were taken to promote the development of trade and service sectors in order to reduce interregional income disparities. Despite the flexible Exchange rate implementation, we can say that the continuous increase in exports has provided short –term (quickly) exit from the crisis. (Tsuru, 1993)

In addition, after the first oil crisis, oil was started to be stocked and resources were started to be allocated to research and development activities in the field of energy. Good relations have been tried to be developed in the field of diplomacy, economic assistance and investment with energy exporting countries. Instead of rapid economic growth policy, state has focused on stability and policies that reduce the rate of energy consumption increase after the crisis. (Yager, 1984: 15-19)

Economic policies were implemented to prevent from the effects of crisis during the first oil crisis. Economic policies that are compatible with energy policies were developed during the second oil crisis and with this way, the effects of the crisis could be overcome more quickly (Dolanay, 1998: 82; Dolanay and Uğur, 2018)

The share of imported fuel in total primary energy supply decreased by 88.2% in 1979 compared to 1973. While the share of imported oil fell 72.8% from 1973 to 1979, the use of alternative energy sources has been increased and the use of imported natural gas has increased. (Dolanay, 1998; Dolanay and Uğur, 2018)

With the second oil crisis, strict monetary policy was introduced, petroleum imports were reduced, and energy consumption in manufacturing industry has fallen. Energy use of manufacturing industry fell from 100 in 1973 to 90 in 1977, 73 in 1980 and 63 in 1982. Sectors which were using information technology and advanced technology came to forefront in industrial production. (Tsuru, 1993)

With the economic policies implemented in the 1980s, the production for domestic demand has increased and exports and foreign trade started to diminish. Mining and industry sectors' production increased 45 times in 1985 according to 1950. (Sadıklar, 1971: 55-78; Dolanay, 1998)

In the process of rapid industrialization in the 1950s, a large percentage of oil was used as an energy source and thus dependence on imported oil began to increase. After the first oil crisis, alternative energy sources began to be used and dependence on imported oil was reduced in the 1980s from 70% to 60%. (The World Bank, 1995: 162-225) In 1973, the share of petroleum in primary energy sources was 77.9%, while in 1977 it was 54.2%. For the same years, the share of nuclear energy was increased from 0.8% to 5.3% and the share of natural gas was increased from 1.6% to 10.55%. (Yager, 1984: 49-50) We could say that, Japanese industries dependency on imported energy, the importance was given to increase in labour productivity, increase research and development and discover of new technologies has effected the Japanese industrial revolution. (Sadıklar, 1971: 55-78)

In order to get rid of the effects of the energy crisis in Japan, dependence on imported oil was reduced, and resource diversification was ensured by using nuclear energy and natural gas. (International Energy Agency, 1997: 130-133) The agricultural sector had a share of 2%, the industrial sector 40% and the services sector 58% of the GDP in 1994 (The World Bank 1996: 188-222) The agricultural sector had a share of 2%, the industrial sector 38% and the services sector 60% of the GDP in 1995. (The World Bank 1997: 214-237) With the year 1996, the low economic growth rate was formed and then the financial crisis which started to be experienced in the Far East in 1997 had affected Japan (Bulutoğlu, 1997: 10). With the use of advanced technology in the 1980s, both research and development expenditures and the use of technical personnel increased (Sadıklar, 1971: 71-78). In the 1990s, the Japanese economy, under the leadership of the financial sector, gained a weighted economic structure, has the most sophisticated technology and the most educated population in the world. (Dolanay, 1998: 87; Dolanay and Uğur, 2018).

Coal production ended in Japan in 2002, after which the country became fully dependent on imports in coal. As the use of coal in energy acquisition leads to environmental pollution, the share of natural gas in Japan's energy production is increasing, but natural gas is a more expensive source of energy, which leads to an increase in foreign trade deficit. As of 2013, Japan's primary source of energy was oil and coal, and imports of petroleum and coal were the third most important natural gas imports. As of 2012, the share of oil in total primary energy resource consumption was 47%, coal share 27%, natural gas 24%, nuclear energy 1%, other renewable energy resources 2%. (Şişmanyazıcı, 2018)

Japan is the country with the best practices in energy efficiency and Japan is the most advanced country in the struggle to minimize energy intensity in the world. Energy Saving Law has been renewed in 1999. One of the most important elements of the renewed law was the Top Runner Program. Efforts to save energy and increase efficiency in Japan are supported by the state. In Japan, where there is a great deal of external dependence on primary energy sources, therefore increasing energy efficiency is one of the priority issues of the state. For this reason, the plans and programs related to this subject have been discussed in a wide framework and spread over time. (Energy Efficiency in the World (Japan, USA and EU), 2018: 5-7)

Japan's dependence on imported fossil fuels consisting of petroleum, coal and natural gas in primary energy supply was 94% in 1973, but this rate dropped to 81% in 2010; because of the nuclear plants accidents after earthquake said rate increased to 89% in 2016. In 1973, the share of coal in the primary energy supply was 16.9%, the share of petroleum and other fossil fuel types was 75.5%, the share of LNG was 1.6%, the share of nuclear power was 0.6%, and the share of hydroelectric power was 4.4%. As of 2016, the share of coal in the primary energy supply was 25.4%, the share of oil and other fossil fuel types was 39.7%, the share of LNG was 23.8%, the share of nuclear power remained at 0.8%, the share of hydroelectric power was 3.3%, the share renewable energy and the share of other alternative energy sources was 7%. In 2010, the share of nuclear power was 11.2%. (Japan_energy, 2017)

Although Japan has grown economically in 2017, total primary energy consumption has fallen by 0.1% as a result of efforts to save energy. As a result of the efforts to increase energy efficiency, total primary energy supply decreased by 0.1% in 2017. (Economic and Energy Outlook of Japan through FY2018, 2017: 1-3)

It is considered to benefit more widely from nuclear power plants in Japan compare to today's usage in Japan's 2030 primary energy supply program. In addition, increasing energy security and energy efficiency, together with benefit more from renewable energy resources are expected to be more oriented. Thus, it is planned that the share of coal in total primary energy sources will be 26%, the share of oil will be 3%, the share of LNG will be 27%, the share of renewable energy will be 22-24% and the share of nuclear power will be 20-22% in 2030. (Japan's Energy White Paper 2017, 2017)

Currently, 50 nuclear energy reactors are operating in Japan and two more reactors are planned to be installed. USA has the highest number of reactors with 104 nuclear reactors in the world. France ranks 78% in terms of the share of nuclear energy in the production of electricity. There are 56 reactors in France, 33 reactors in Russia, 20 reactors in Canada, 16 reactors in the UK, 9 in Germany is operating. (www.internethaber.com, 2018: 3-4)

After the Fukushima crash with earthquake in October 2011, the government wanted to reduce the role of nuclear power in the supply of the energy. However, the government which started its new post with the change of administration in the 2012 elections, has a 20 year forecast in 2014. He explained The Forth Strategic Energy Plan. Nuclear Energy placed as a main source of energy in the Strategic Energy Plan. (World Nuclear Association, 2018: 2)

While the share of nuclear energy in electricity generation was 30% in 2011, it was planned to increase to 41% in 2017 and to 50% in 2030. Then in 2015, the government revised the nuclear energy plan and announced plans to increase its share of nuclear energy in electricity to 60% by 2030. (World Nuclear Association, 2018: 2)

Throughout the world, the process between 1960 and 1973 was a period when oil based energy was relatively cheap. In this period, the dependence of all countries to oil based energy imports, including Japan, has increased. (Dolanay, 1998: 79; Dolanay and Uğur, 2018: 3-10) However Turkey's economic development process did not have chance to rely on oil-based energy after 1973.

3. Turkey

The mines were removed by foreign companies during the Ottoman Empire and mining started with hard coal. The first lighting application started at the end of the 19th century with the ferryboats coming from the company Hayriye. In 1905, in Izmir and Thessaloniki, then in Damascus and Beirut, and in 1923 in Adapazari, electricity was switched on. (Çavdar, 1983: 690-698; Ultanir, 1994: 41; Dolanay and Uğur, 2018)

It was aimed to make improvements in Ereğli Zonguldak, Soma and all other coal basins and to ensure that all national enterprises, trains, factories and agricultural machinery use domestic coal in the 1st Economy Congress held in İzmir in 1923. (Mutluer, yty: 186)

However, in the 1923-1930 period, electric energy investments were realized with the privileged status granted to foreigners (Çavdar, 1983: 690-698).

During the period 1923-1930, Isbank carried out hard coal operations while lignite mines were operated by the private sector. In 1926, while the right to seek oil within the country belonged to the government, petroleum products marketing was carried out by foreign companies. Privileged foreign partnerships continued to operate in the electricity sector (Ultanır, 1994: 42). Between 1930 and 1939, an industrialization move was initiated by the statist-conservative economic policy. (Boratav, 1993: 45-62)

No significant investment was made in the years 1940-1945. Foreign trade surplus was realised in parallel with the decrease in imports more than export. In the period 1946-1953, imports were liberalized and external deficits started to be given with the increase in imports. A development strategy has been identified that prioritizes agriculture, mining, infrastructure and construction sectors. National income grew at an annual average rate of 11% over the period at constant prices. (Boratav, 1993: 63-84)

Turkey in 1950, 96.2% thermal power generation system, 3.8% have used primary sources. The share of hard coal, which has a predominant place in thermal sources, was 66.48%, while lignite was 17.37% and fuel oil was only 10.33%. Although the use of lignite was started to be used more than 1930, it was observed that the hydraulic power was not used sufficiently. Prior to 1952, priority was given to large cities. (Çavdar, 1983: 690-698)

While 30.5% of the population benefited from electrical energy in the 1960s, there were two regional systems with two large interconnected systems. (Çavdar, 1983: 690-698)

In the 1950-1960 period, the company was trying to attract private sector investments and foreign capital. The share of the private sector in lignite production increased from 17% in 1950 to 40% in 1960. (Ultanir, 1994: 43)

The production of durable consumer goods in the domestic assembly industry was realised in the period 1962-1976. In the following years, it has been observed that the domestic input rate has increased gradually in the assembly industries established during this period. Import substitute production facilities for intermediate goods such as iron, steel, copper, aluminium, petrochemical, chemical and construction materials were also established with the contribution of the public sector. While the share of industrial products in exports in the 1960s was about 13-18%, it was

around 20-39% in the 1970s. In the period 1962-1976, the average economic growth rate was 6.6%. (Boratav, 1993: 95-118)

There was no change in the management of hard coal, while the majority of lignite production was carried out by the state between 1960 and 1980. (Ultanır, 1994: 44-45)

By 1972, 39% of the population gained electricity (Çavdar, 1983: 690-698). Among the primary sources used, fuel and hydraulic had a major share (Dolanay, 1998: 113). Only 20% of the oil demand is provided domestically and the other part is imported (Second Five-Year Development Plan, 1968: 558-560).

It was stated that development will be achieved in the free market economy and export-based growth model in the 1980s (Türel, 1985: 94-103). After 1980, the only factor that was important in supplying resources was the relatively cheap resource available (Sixth Five-Year Development Plan, 1990: 257-269). Thus, the dependency process to the imported source in the 1970s seems to have continued. However, instead of petroleum, it was seen that this time another natural resource which is dependent on natural gas was entered.

Electric energy has produced from hard coal with the rate of 42.7% and from hydraulic power (water resources) with the rate of 31.6% in 1962, the share of hard coal and water resources decreased, and the share of fuel oil increased in 1967 compared to 1962. The share of the fuel increased from 24.8% to 43.9%, the share of water resources decreased from 38.3% to 28.5% in 1972, compared to 1967. In 1977, the share of fuel oil decreased to 33.4% compared to 1972, while the share of water resources increased to 41.8%, while the share of lignite increased from 13.3% in 1972 to 17.5% in 1977. (Dolanay, 1998: 132; Dolanay and Uğur, 2018)

In the production of primary energy sources, the share of lignite between 1984 and 1988 fell from 9.62% to 9%, the share of petroleum products decreased from 41.8% in 1984 to 39.2% in 1988, the share of water resource from 14.6% to 25.2% has come to. The decrease in the share of oil in primary resources and the increase in the share of water resources has been seen as a positive development that reduces the dependence on oil. The share of lignite increased from 33.7% to 40.2% in 1989, the share of petroleum products increased to 39.1% in 1994, while the share of water resources increased from 20.9% in 1989 to 23.1% in 1994; share decreased. As of 1990, only 37% of the hydroelectric potential could be reached. The share of petroleum products in total primary energy resource consumption fell from 41.8% in 1984 to 40.4 in 1988, the share of natural gas increased from 0.1% to 2.2%, while the share of water resource from 8.6% to 14.7%. There was no significant change in lignite and hard coal usage during the period. Therefore, there has been a tendency towards the use of oil and petroleum products to use water resources and natural gas. (Dolanay, 1998: 134-136; Dolanay and Uğur, 2018)

The share of petroleum products in total primary energy resource consumption continued its downward trend in 1989-1994, while the ratio of 40% in 1989 decreased to 39.8% in 1994 with a small decrease. While the share of natural gas in total was 2.2% in 1988, it increased to 5.2% in 1989 and 8.3% in 1994. While the share of the water source did not change much in the period of 1989-1994, small decreases were observed in the use of lignite and hard coal. Hard coal consumption increased by 2.6% between 1978 and 1983 and increased by 12.7% between 1989

and 1994 (Dolanay, 1998: 133). In the 1984-1988 period, the consumption of petroleum products fell relatively and the use of natural gas and water resources increased, but after 1989, there was a tendency to use imported natural gas (Dolanay, 1998: 137). Oil consumption declined by three thousand in the period 1978-1983 and increased by 5.1% and 7.8% in the period of 1984-1989 and 1989-1994, respectively. This is a relative decrease. While natural gas consumption decreased in the period of 1978-1983, it increased by a high rate of 138.1% between 1984 and 1989 and increased by 18.8% between 1989 and 1994 (Dolanay, 1998: 133). Thus, dependency on imported petroleum was reduced while another import source, natural gas dependency, was established. However, it should be possible to go as far as possible to the resource diversity within the resource utilization structure, to make more use of hydraulic energy and to be among the sources used in nuclear energy (Dolanay, 1998: 137). Imports of electrical energy increased by 28.9% between 1978 and 1983, while imported electricity consumption decreased by 33.3% between 1984 and 1989 (Dolanay, 1998: 133; Dolanay and Uğur, 2018).

While the share of thermal energy was 58% in total production in 1989, the share of hydraulic energy was 42%, the share of thermal energy in total consumption was 65.5% and the share of hydraulic energy was 34.5%. While the share of hydraulic energy in production was 47% in the sixth plan period, its share in consumption was 39%. (Sixth Five-Year Development Plan, 1990: 257-269)

While the share of thermal energy in total production was 56% in 1994, the share of hydraulic energy was 46%. While the share of thermal energy in total consumption increased to 68%, the share of hydraulic energy remained at 32%. Therefore, we can say that total consumption has increased faster than hydraulic consumption. In 1994-1995, energy exports were made. Exports seem to be caused by economic recession and even decline rather than the increase in energy production. (Sixth Five-Year Development Plan, 1990: 257-269)

Hydraulic energy production decreased by 13% between 1995 and 2000 and by 22% between 2000 and 2001, and increased by 84% between 2001 and 2006. While the share of hydraulic energy in total energy consumption was 38% in 2000, it was 44.4% in 2006. (2005-2006 Turkey Energy Report, 2007: 6)

Despite this increase, the combined use of oil and natural gas increased to 62.96% in 2006. This dependence on two fossil fuels, such as oil and natural gas, revealed the necessity of establishing a nuclear power plant. (Dolanay and Uğur, 2018: 12-18)

In 2003, primary energy resources were obtained by 38% oil, 27% by coal, 23% by natural gas and the remaining 12% by hydraulic energy resources. In 2005, 72% of the energy demand was met by imports. (Külebi, 2007: 30-31)

Even though the lack of sufficient energy resources for our own needs makes importation mandatory, it is thought that imports should be met from as many countries as possible with a rational approach (Külebi, 2007: 31-33). For example, the total energy consumption of natural gas consumption in the total energy consumption to reach about 30% with the single or petroleum can create dependence on two sources. (Külebi, 2007: 31-33) As a result of the distribution of general energy consumption to primary energy sources as of

2006, hard coal received 23% and natural gas 31.44% share. (2005-2006 Turkey Energy Report, 2007: 6) Therefore dependency on natural gas was increased according the past. (Dolanay and Uğur, 2018: 12-18)

The share of natural gas in final energy consumption rose from 1.9% in 1990 to 17.4% in 2006. In this period, there was increase in geothermal energy use and solar energy consumption. Electricity energy production from the wind power has started since 1999. Petroleum share accounted for 35.6% of final energy consumption in 2006. Dependence on fossil fuels such as oil and natural gas continued in 2006. Oil, natural gas, Stone, coal and electrical energy were imported in 2006. (2005-2006 Turkey Energy Report, 2007: 8-9)

The share of oil in final energy consumption decreased from 36% to 35.6% from 1990 to 2006. (2005-2006 Turkey Energy Report, 2007: 8)

Coal share of the demand for primary energy use was 30%, petroleum share was 28%, natural gas share was 10% and remaining part of share was met from renewable energy sources in 2012 in Turkey. (BOTAŞ 2014 Sector Report, 2015: 13)

As of 2014, Turkey's electric energy thermal energy sources, the rate of production (coal, oil and natural gas), energy 79.5%, hydropower 16.1% and renewable energy (wind, solar and geothermal) was 4.3%. The share of renewable energy resources increased from 0.1% in 2002 to 4.3% in 2014 and to 5.8% in 2015. As of 2015, the rate of energy sources of electricity generation was 68.5%, hydraulic energy was 25.7% and renewable energy sources were 5.8%. (World and Turkey Energy and Natural Resources Outlook, 2016, 17)

The share of oil in the primary energy supply was 30.3% and the share of natural gas is 30.7%, the share of coal 17.4% share of lignite 9.4%, the share of hydraulic energy by 4.5% and the share of geothermal heat and other heat sources 3.7% and the share of the wind power 0.8% the share of solar energy and the share of electricity was 0.3% and 0.6% in 2015 in Turkey (Turkey energy Outlook, 2017: 10). Turkey's share of oil in the use of primary energy in 2015 was 30%, the share of natural gas was 31%, the share of coal 27%, the share of hydropower has been the share of 4.5% and other renewables were 7.5% (2016 Year Crude Oil and Natural Gas Sector Report, 2017, 30).

The share of total of coal, oil and natural gas was 87.3% in Turkey's total primary energy consumption in 2016. Although coal and oil consumption increased in the 2000-2016 period, the share of these resources in total primary energy consumption decreased. Coal had a share of 28.6% in 2000 and its share in 2016 was 28.2%. The share of petroleum in the year 2000 decreased from 42.3% to 31% in 2016. The share of natural gas in the year 15.7% increased to 28.1% in 2016. The share of renewable energy sources consisting of solar, wind, geothermal heat and biofuels increased by 14.4% on average between 2000 and 2016. (2000-2016 Turkey Energy Efficiency Development Report, 2018, 12)

Turkey's primary energy intensity decreased by 19.6% in 2016 compared to 2000 and thus energy efficiency has increased. (2000-2016 Turkey Energy Efficiency Development Report, 2018, 18)

Energy types that produced did not meet demand are imported and presented to consumers. Turkey met by outsourcing may be said that 60% of the energy demand. The largest share in external resources has oil. However, the share of natural gas is also increasing. (Külebi, 2007: 34)

The share of natural gas usage in electricity generation was 26% and the share of coal was 35% in 2002. The share of natural gas increased to 44%, while the share of coal decreased to 20% in 2006 (Külebi, 2007: 40). It has been observed that the use of domestic resources has not been adequately encouraged as of 2006 (Dolanay and Uğur, 2018: 12-18).

As of 2006, the GNP per capita realized as 5477 USD, the unemployment rate was 9.9%, the GDP growth rate was 6.9% and the GNP growth rate was 6%. In 2007, the GDP growth rate was 4.7% and the GNP growth rate was 4.5%. It has appeared in a developing country with Turkey's economic structure. (<http://www.ktu.edu.tr>; www.tuik.gov.tr; www.kalkinma.gov.tr)

As of 2016, GDP per capita was realized as 12670 USD, unemployment rate was 8.9% and GDP growth rate was 5%. Turkey can be the fastest way relative to the global economic crisis that occurred in 2009, economic development is carried out with the annual high economic growth rate between 2003-2008 after 2009 has entered the road be able to also perform can say. GDP per capita increased more than 3 times between 2002 and 2013 and rose to US \$ 10782 from US \$ 3492. (<http://www.ktu.edu.tr>)

3.1. General Evaluation

The oil crisis of 1973-1974; Failure to reduce dependence on imported energy in Turkey and even the country's economy has been deeply affected in any way because of this need to be brought up. After this date, it was emphasized that energy saving and alternative energy sources should be directed. In this period, however, the adequate use of alternative energies and the transition to nuclear energy could not be achieved. (Fourth Five-Year Development Plan, 1979: 394-408)

Although energy investments were prioritized in the second oil crisis, import dependence in energy consumption was not reduced. The use of high external debt due to the first crisis determined the severity of the 1977 crisis and the effects of the crises on the country's economy were greater. (Dolanay, 1998: 115) The deepening of the economic crisis has made comprehensive economic policy changes in the country economy in a sense. 24 January 1980 economic stability program was in question. Although imports continued to be important in order to meet the growing energy demand, various measures were taken in order to attract the private sector to energy investments. (Ultanır, 1994: 45-46)

The energy density per unit output is higher in developed countries than in developed countries, and the energy density increases as industrialization and economic growth rate increase (Saarçioğlu & Küçükaksoy: 6). As a developing country, Turkey was forced to use increasing amounts of energy in the process of industrialization, the growing need for it is the power of oil to meet the flow for failing to meet alternative energy boils were on the path to meet all the necessity. Since it cannot meet all the needs of alternative sources, it is necessary to turn to nuclear energy.

We can say that the rapid economic development brought about by the high economic growth rates achieved in the period between 2002 and 2016 has also reflected on the developments in the energy sector. In the period between 2002 and 2016, the share of renewable energy sources in primary energy supply, primary energy use and electricity production increased. Energy efficiency increased. (Dolanay and Uğur, 2018: 17-19)

Although the investment cost of nuclear power plants is higher than coal and fuel oil power plants, the cost of electricity generation is lower as annual fuel costs are lower (Tuncer, 2003: 81-97). One of the most important features of nuclear power plants is that their fixed costs are high and their variable costs are lower. For this reason, nuclear power plants are the leader in terms of building cost per unit installed power compared to other power plant types, excluding interest and financing costs. It can be said that the more energy produced during the life of a power plant, the

more efficient the plant can be used at the same rate. Therefore, coal and gas power plants, which can be commissioned in a short time and are more cost-effective than nuclear power plants, are the types of power plants with higher fuel costs in the long term. In the case that such power plants generate an equal amount of electricity, the fuel costs will be much more expensive than nuclear power plants (Demirbağ, 2013: 72-73).

Turkey's nuclear power plant planned to be established in two different locations and Mersin / Akkuyu has started the construction of the Akkuyu nuclear power plant. Although nuclear power plants caused environmental pollution, and therefore it was said that it was not correct to establish, the practices around the world showed the opposite. In Finland, it was seen that it could catch fish near the nuclear power plant, 5 nuclear power plants could be established on the Loire River and 6 nuclear power plants were found 200 km away from Paris. Similarly, six of the 16 nuclear power plants in the UK were 75 to 200 km from London. Again in Belgium, agricultural activities can be maintained in the immediate vicinity of the Doel nuclear power plant. (Saraçoğlu, 2018: 45-47)

Thorium mine can be used to obtain energy from nuclear power plants just like uranium. Moreover, the yield is higher than that of uranium, making nuclear plant explosions difficult. Turkey has the world in terms of thorium mine with numbered largest reserve of 380,000 tons. (Adalıoğlu et al., 2001)

The amount of resources needed to obtain the same amount of energy is one ton for thorium, 200 tons for uranium, 1,000,000 tons for oil and 3,500,000 tons for coal. (Unknown about thorium mine and Thorium Truth, 2017)

In addition, it imports 98% of the natural gas currently used by Turkey. Approximately 50 billion USD is spent each year for energy import. When Akkuyu and Sinop nuclear power plants come into operation, we can say that 7.2 billion US dollars natural gas will not be purchased. (Saraçoğlu, 2018: 45-47).

4. Conclusions and Recommendations Regarding Turkey's

Future Energy Policy Preferences

After the experiences in the world, it is understood that there is a distance in the use of alternative energy sources instead of oil. The natural gas plants in Turkey with the way established in the last period, from oil to natural gas provided orientation, though, we can say lasted two sources, such as dependence on oil and natural gas. In the 2002-2016 period, renewable energy sources could be utilized more, but the energy needs could not be met from renewable energy sources. Therefore, it is planned to establish nuclear power plants in the first place and then third in the first place by utilizing both the diversification of resources and the supply of energy from nuclear power plants which are cheaper than oil, coal and natural gas. Exploitation projects in the energy supply from nuclear power plants, Turkey is a second type of fuel will enter the world ranking in terms of thorium mines were important extent due to a rich country that can be used in nuclear power plants.

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