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**ISTANBUL KÜLTÜR UNIVERSITY**

**INSTITUTE OF GRADUATE STUDIES**

# TÜRKİYE AND RUSSIA RELATIONS WITHIN THE FRAMEWORK OF TÜRKİYE'S ENERGY POLICY

**MA Thesis by**

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**Department: International Relations**

**Program: International Relations**

**Supervisor: Assoc. Prof. Dr. Çağla Gül YESEVİ**

**SEPTEMBER 2022**

**REPUBLIC OF TÜRKİYE**
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| **Üniversite** | **:** | **ISTANBUL Kültür Üniversitesi** |
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# ÖZET

Ülkelerin ekonomik, sosyal, siyasi ve birçok alanda kalkınma sağlayan ana faktör enerjiyi kullanmaktır. Enerji kaynakları günlük hayatın en önemli ve hayati girdileri iken, üretimimiz enerji ve endüstriyel ürünler içindir. Bu nedenle ülke ve enerji alanının yönetimini üstlenenler, toplumun ve ekonominin ihtiyacı olan enerjiyi kesintisiz, güvenilir, zamanında, temiz ve ucuz yollarla temin etmek zorundadırlar. Enerji arz güvenliği açısından da en uygun fiyatları sağlamak ve bu kaynakları çeşitlendirmek zorundadırlar. Bu fikirden hareketle devletlerin ortaya koydukları enerji politikası, kendini yenileyen, tutarlı ve gerçekçi olmalı ve aynı zamanda hedef odaklı olmalıdır.

Bu araştırmada Türkiye'nin enerji politikasında nasıl bir rol model kurduğunu ve bu politikanın Türkiye ve Rusya arasındaki ikili ilişkiye nasıl yansıdığı değerlendirilecektir. Bu tez çalışmasının asli amacı, Türkiye ve Rusya ilişkilerinin enerji kapsamında rekabete mi yoksa stratejik ortaklığa mı dayandığı olduğu sorusunu yanıtlamak olacaktır.

**Anahtar Kelimeler:** Türkiye-Rusya İlişkileri, Stratejik Ortaklık, Enerji Politikası

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# ABSTRACT

The main factor that provides economic, social, political and many areas of development of countries is to use of energy. Energy resources are the most vital inputs of daily life and production is made for energy and industrial products. For this reason, those who govern the country and undertake managerial roles in energy have to supply energy through uninterrupted, reliable, timely, clean and cheap ways to meet the needs of society and the energy sector. Given the energy supply security, they must also provide energy at the most affordable prices and diversify these sources. In this regard, the energy policy put forward by the states should be self-renewing, consistent and realistic, and should also be target-oriented.

This study focuses on how Türkiye became a role model in energy policy and this policy's repercussions on the bilateral relations between Türkiye and Russia. The main purpose of this thesis is to answer whether the relations between Türkiye and Russia are based on energy competition or strategic partnerships.

**Keywords:** Türkiye-Russia Relations, Strategic Partnerships, Energy Policy

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# ABBREVIATIONS

| | |
|---|---|
| AECL | : Atomic Energy of Canada Limited |
| bbl/ d | : Barrels per Day |
| bcm | : Billion cubic meters |
| BOTAŞ | : Turkish Petroleum |
| BP | : British Petroleum |
| BTC | : Baku – Tiflis – Ceyhan Crude Oil Pipeline |
| BTE | : Baku – Tiflis – Erzurum Gas Pipeline |
| CIS | : Commonwealth of Independence States |
| $CO_2$ | : Carbon dioxide |
| EMRA | : Energy Market Regulatory Authority |
| EPA | : Energy Policy Assessment |
| G8 | : Group of Eight |
| GDM | : General Directorate of Meteorology |
| HEPPs | : Hydro Electric Power Plant |
| IEA | : International Energy Agency |
| KWh | : Kilowatt- hours |
| LNG | : Liquefied Natural Gas |
| MENR | : Ministry of Energy and Natural Resources |
| MTOE | : Million Tons of Oil Equivalent |
| MW | : Megawatt |
| NEA | : Nuclear Energy Agency |
| NPP | : Nuclear Power Plant |
| OECD | : Organization for Economic Cooperation and Development |
| OPEC | : Organization of Petroleum Exporting Countries |
| PVS | : Application of Photovoltaic System |
| RF | : Russian Federation |
| SEPA | : Solar Energy Potential Atlas |
| Sm3 | : Standard Cubic Meters |

| | |
|---|---|
| Tcf | : Trillion cubic feet |
| TETI | : Türkiye Electricity Transmission |
| TOE | : Ton of oil equivalent |
| TWh | : Terawatt–hour |
| WPP | : Wind Power Plant |

# INTRODUCTION

The need for energy sources in the world continues to increase. This is especially the case in developing countries, where energy consumption continues to increase every year with population growth, industrialization, increase in people's welfare level and technological developments. The interest in renewable energy sources has increased due to reasons such as fossil energy sources causing serious environmental problems, depletion of fossil fuel reserves, dependence on source countries causing various political and economic problems, and price instability. Renewable energy resources like hydraulic, wind, geothermal, solar, biomass, wave, and hydrogen are used in various ways, mainly for power generation, especially in developed countries.

Despite all these developments, the superiority of fossil energy resources in the world's primary remained limited to energy consumption and continues to maintain this superiority in the short term.

Convergence between states at various levels in international politics has become an inevitable dynamic. These convergences sometimes mean an opportunity as well as a necessity for states. These convergences between states at various levels and dimensions can be in the form of an entente in which the parties will only consult or alliances with comprehensive security guarantees. However, it is unthinkable for every alliance formed between states to take on a strategic dimension; generally, the main reason that pushes states to take part in an alliance is their inadequacy to ensure their own security. Convergences, in the form of strategic cooperation and partnership, appear as different types of alliances. It is useful to clarify these concepts since such convergences are less often dealt with within alliances. Strategic relations emerge as a reality of power-centered international politics. This situation brings with it the need to classify strategic relations as strategic relations can show themselves in the form of cooperation and partnership, and they can also be asymmetrical. Strategic cooperation means cooperation for a shorter term and in a limited field, while strategic partnership

means pursuing longer-term comprehensive goals depending on internal political harmony. Strategic cooperation is more vulnerable to possible inconsistencies, while the strategic partnership is more durable. If the distinction between strategic partnership and strategic cooperation cannot be made correctly, the situations in which a strategic relationship is deadlocked will not be adequately understood. In particular, the necessity to clarify the concept of strategic partnership arises from the fact that this concept is frequently included in the current international relations discussions after the Cold War. It is necessary to look for this concept to have a much greater place in the post-Cold War world in the international system's encouragement of multipolarity. Aside from the fact that a multipolar world encourages strategic relations, we see that the concept of strategic partnership, which is used to describe the strategic relationship between two states, is used haphazardly many times. The necessity of clarifying this concept and drawing its boundaries correctly also comes from this.

Energy, which has such an important place today, has a unique importance in the relations between Türkiye and Russia. As is the case in the economic and political fields, energy has the potential to affect the relations between Türkiye and Russia directly. This study focuses on the cooperation between Türkiye and Russia in the field of energy and their potential and important relations. Türkiye and Russia’s energy relations have developed especially in the 21st century, given Türkiye's increasing energy needs. While Russia has become an important supplier for Türkiye with its rich energy resources, Türkiye has become an important source of income for the Russian economy with its rapidly increasing energy imports. The energy trade, which started with coal and oil, gradually moved to the natural gas field.

In the first and second chapters of the study, which consists of three main chapters, the energy policies of Türkiye and Russia are examined. The first two chapters analyze five main factors in energy resources by dividing them into coal, oil, natural gas, nuclear energy and renewable energy subsections. The first chapter concentrates on the past, present and future of energy resources in Türkiye in general. In addition to the information given about energy resources and their distribution, the current status of energy policy in Türkiye and its reflections on the

future are also covered. Moreover, the study tries to take a closer look at the parameters that should be taken into account in energy policies to evaluate the current status of Türkiye in the field of energy, question whether its resources are sufficient, outline its problems and come up with some suggestions.

The second chapter discusses the production and consumption statuses of different energy resources from Russia’s perspective. In addition, Russia's energy policy and energy resources are discussed.

The third chapter examines the relations between Türkiye and Russia from the energy perspective. In addition, issues such as the competition in the relations between Türkiye and Russia, possible cooperation areas, and the future of their relations are discussed.

This study also focuses on the Blue Stream project between Türkiye and Russia. The Blue Stream, Türkiye's largest natural gas project, was realized in partnership with Russia. Detailed information is also given about the Akkuyu Nuclear Power Plant and the TurkStream project, an intergovernmental project between the Republic of Türkiye and the Russian Federation. 16 billion cubic meters of natural gas flow to Türkiye through the Blue Stream pipeline. In this sense, the TurkStream project, which will provide an annual natural gas flow of 63 billion cubic meters, is critical for Russia, Türkiye and EU countries within the scope of energy supply security.

In the conclusion part of the study, relations between Türkiye and Russia; In international politics, partnerships mean that bilateral relations go beyond cooperation or alliance. Partnerships are a long-term building activity where two states unite around a common mission in the international arena. Therefore, relationships are based on trust in the long run. In this context, it has been found that the relations between Türkiye and Russia are based on strategic partnership.

# 1. TÜRKİYE'S ENERGY POLICY

## 1.1. General Definitions and Review

Since energy can take many forms, it is impossible to give a comprehensive definition. Still, the most common definition is that energy is the ability of a substance or machine to do work. Derived from the words *εv (en)= active* and *εργονί (ergon)= work* in the ancient Greek language, it later began to be used in the sense of the ability to do business (Turkish Language Society). Therefore, every production activity requires certain energy expenditure (Karluk,1999). In the dictionary of the Turkish Language Association, energy is defined as the power that emerges in the form of heat, light, existing in matter. It is widely used in human life in the form of mechanical energy, light energy or heat energy (according to the dictionaries of the Turkish Language Institution). In daily life, the term "energy" refers to work and heat, which are transitional forms of energy. The heat boils the water and the resulting steam turns the turbines to generate electricity. Therefore, heat is a form of energy.

Energy can neither be created nor destroyed, only transformed into different forms. The sum of all forms of energy in a volume can only be changed by the amount of energy entering or leaving that volume.

Energy can take various forms, including chemical, nuclear, mechanical (potential and kinetic), thermal, geothermal, hydraulic, solar, wind, and electrical energy, and can be converted to one another using proper procedures. Energy resources are resources that obtain energy through various economic processes and are categorised in various ways (Koç & Şenel, 2013). While energy resources are classified as renewable or non-renewable based on their consumption, they are further classified as main or secondary based on their recyclability. This will be examined in more detail in Chapter 2.

Energy is a critical component of both the Turkish and global economy. States and international organizations struggle for access to energy resources (oil, natural gas, coal, etc.). Energy is an essential component of daily life and the infrastructure

of industry. As a result, the need for energy is high on the national and international agendas. Countries are continually competing to have safe, sufficient, inexpensive, and clean energy due to depletion of energy resources, external dependency, and environmental repercussions. Energy generation is one of the world's most persistent economic, political, and social issues. Türkiye's energy requirements are constantly increasing as a result of the country's rapidly expanding industry, economy, and population. For this reason, it is of great importance to increase the existing energy resources, evaluate the potential of alternative and renewable energy resources, and use the energy produced with high efficiency (Bayraç, 2010).

### 1.2. Türkiye's Energy Status

Türkiye is a country that does not have a longstanding history in energy policies; it has not been able to implement its energy strategy and planning work until recently. The main reason is that the country's policies focus on security and defense. With its stable and recently developing economic structure, Türkiye has started to develop policies that adopt foreign expansion and integration with the global world. Realizing the importance of energy in the developing trend of the 21st century, Türkiye has seen energy as one of the centers of its basic policies while forming its foreign policies (Durmuşoğlu, 2015).

Energy has not been among the main issues in Türkiye's foreign policy until recently. Energy policies are the basis for developed countries' economic, military and technological development. While developing their long-term country policies, powerful states and developing states worldwide make plans based on energy and energy policies. The most basic requirement for sustainable development and the continuation of the welfare of societies has been energy, especially in the 21st century.

Countries can ensure sustainable development and social welfare by meeting the increasing energy demand. In this context, one can say that Türkiye is not a self-sufficient country considering its current energy resources. However, due to its geographical location, Türkiye is far more fortunate than many other countries in terms of its energy potential (Yılmaz, 2017).

Considering its growing economy, being one of the G-20 countries, its geopolitical position, historical mission and current potential, Türkiye has the power to achieve these goals if it implements rational and strategic policies to achieve its goal of being among the top 10 developed countries of the world in line with the vision of "Great Türkiye". Türkiye has to reduce its dependence on imported energy to achieve the targeted international power and country welfare (Hacıgökmen, 2019).

Mehmet Şimşek, the Minister of Finance of the period (2009-2015) announced that Türkiye realized 54 billion dollars of energy imports in 2011 in his speech at the 7th Ordinary General Assembly of the Young Businessmen's Association of Türkiye (TÜGİAD) Ankara Branch. According to 2022 data, Türkiye's total imports increased by 40,8 percent in the first nine months of the year compared to the same period of the previous year and amounted to 145 billion 675 million dollars. On the other hand, energy imports decreased by 31 percent from $31.2 billion to $21.5 billion in this period (Turkish Statistics Institute-TÜİK, 2022). Türkiye has realized the projects on this axis and the studies, strategies, and bilateral relations within the framework of foreign policies have a significant influence in developing energy policies (TÜİK, 2022).

### 1.2.1. Energy Production and Consumption in Türkiye

As a developing country, Türkiye has been gaining more importance in the global energy market as both a regional energy trade center and a growing consumer with its growing population and developing industry. Türkiye's energy consumption, which has been increasing in recent years, is likely to continue.

According to the Ministry of Energy and Natural Resources data, Türkiye's total energy supply in 2018 was 143.66 million TOE. With 41.91 million TOE, oil took first place in the distribution of this supply to resources, with 29.17 percent of the total supply. Natural gas comes second with 41.17 million TOE and 28.66 percent share, followed by coal with 40.98 million TOE and 28.56 percent share. Geothermal, wind and solar energy amount to 11.60 million TOE with a share of 8.07 percent. Hydraulic follows with 5.16 million TOE and a share of 3.59 percent. Finally, bioenergy, waste and other resources followed with a share of 3.01 million

TOE and 2.10 percent (Yılmaz Ş., 2016). In the BP Statistical Review of World Energy 2019 report, Türkiye's 2018 primary energy supply was 153.5 MTOE (petroleum 48.6 MTOE, natural gas 40.7 MTOE, coal 42.3 MTOE, hydraulic 13.3 MTOE and renewable 8.5 MTOE).

Interestingly, the BP data point to a 6.85 percent higher primary energy supply overall than the Ministry of Energy and Natural Resources data. On the other hand, Türkiye's primary energy demand has almost doubled to 222 million tons of oil equivalent by 2020, but according to the data for 2023, it is expected that the demand will decrease to 218 MTOE. The distribution of Türkiye's total energy production based on resources is summarized in Figure 1.

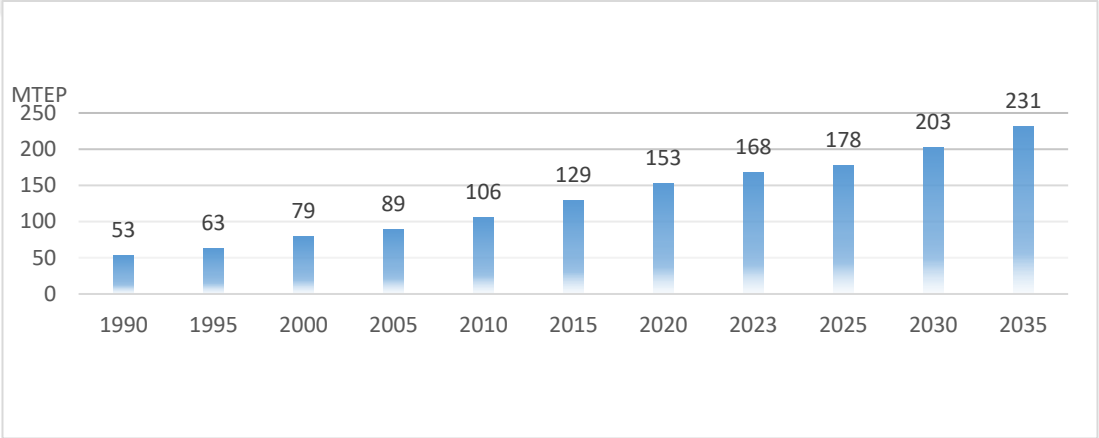


**Figure 1-1. Primary Energy Demands According to Annual Increase Rates in Türkiye's Primary Energy Supply (MTOE)**

**Source:** BP, Statistical Review of World Energy, 2019.

When the Turkish economy's first nine months of 2016 and 2017 in terms of import, production, export and consumption figures are compared, there is a 20.33 percent growth in imports between the two periods. While there was a 3.8 percent contraction in production and 9.6 percent in exports, consumption values grew by 17.67 percent. The growth in 2019 was 9 percent.

The Turkish economy grew by 5.9 percent in the last quarter, completing the year 2020 with a growth rate of 1.8 percent despite the impact of the global epidemic. In parallel with Türkiye's economic growth, energy consumption is also increasing rapidly. Among the G20 countries, where developed and developing countries come together, only Türkiye stood out with a growth rate of 1.8 percent

and China with a growth rate of 2.3 percent among other countries. Türkiye became the second fastest growing economy in the world after China in 2020 (TÜİK, 2020).

Türkiye joined the Organization for Economic Cooperation and Development (OECD) in 1960, and it has had the fastest-growing energy consumption in the previous 15 years. Despite Türkiye's tremendous economic expansion, energy demand remains modest in comparison to the country's energy consumption. (Tiftikçigil & Yesevi, 2015).

Figure 1-2 depicts the distribution of Türkiye's energy resources in terms of energy use. Türkiye's reliance on oil and natural gas accounts for a substantial share of its energy consumption. The following energy resources account for 33% of total energy consumption: natural gas (33%), oil (27%), hard coal (15%), lignite (14%), and hydraulics (4%).

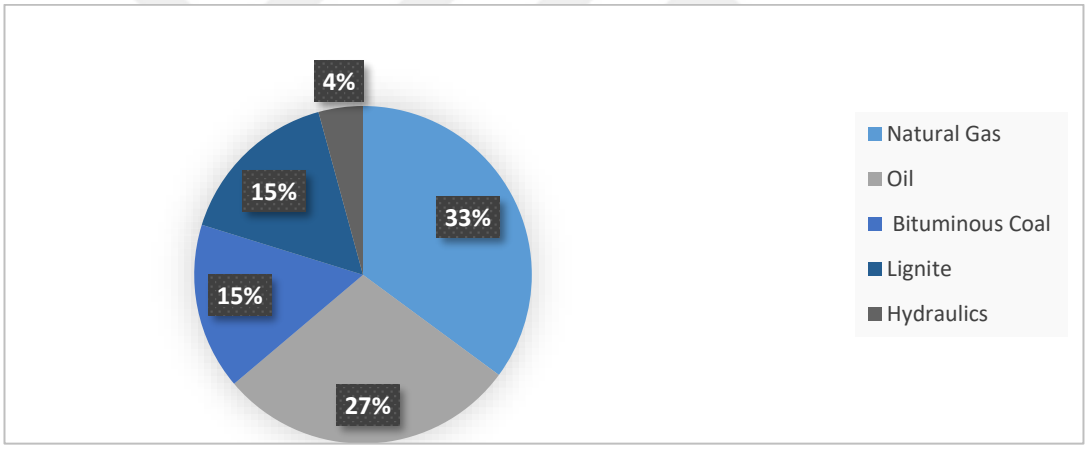


**Figure 1-2. Percentage of Oil, Natural Gas and Coal in Primary Energy Consumption in Türkiye**

**Source:** The Republic of Türkiye, Ministry of Energy and Natural Resources, 2018a, p. 12.

Figure 1-3 depicts the distribution of Türkiye's energy resources in terms of energy use. As a result, the housing sector accounts for 16% of total energy consumption, while the service sector accounts for 9%, the industrial sector accounts for 24%, the conversion sector accounts for 23%, and transportation accounts for 20%. Agriculture accounts for 3% of the total.

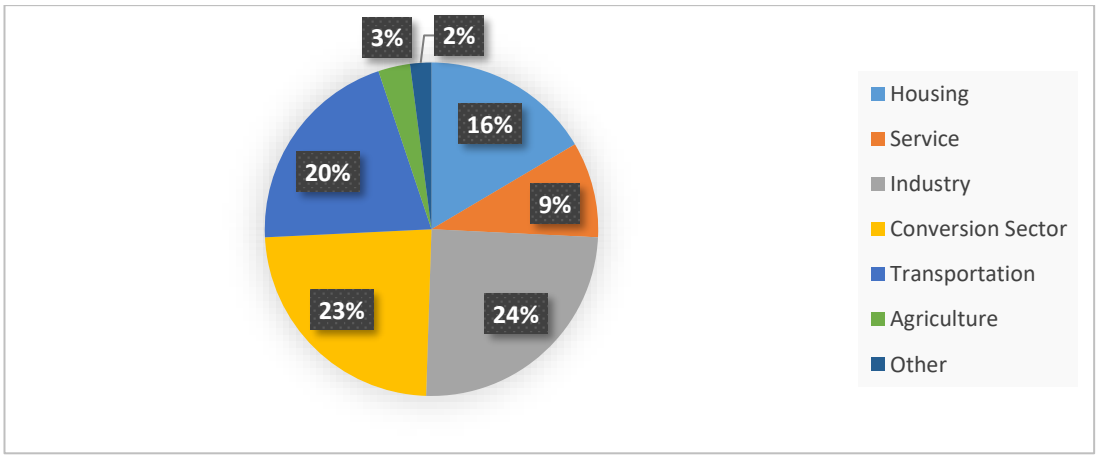


**Figure 1-3. Sectoral Distribution of Türkiye's Energy Consumption in 2017**

**Source:** Türkiye Petrolleri, 2018, p. 22.

### 1.2.2. External Energy Dependency of Türkiye

Although Türkiye possesses a varied variety of fundamental energy resources, it is not an energy-rich country. Hard coal, lignite, asphaltite, crude oil, natural gas, uranium, and thorium are among the fossil resource reserves of Türkiye, while renewable energy resources include hydraulic, geothermal, solar, wind, and sea wave. However, the resources available are insufficient to meet the country's energy needs. Türkiye is not an oil and natural gas-rich country. Türkiye can only afford 10% of it's oil consumption and 3% of natural gas consaption from domestic sources. Furthermore, importing nearly all of the natural gas utilized for energy security is exceedingly dangerous. Natural gas conversion plants account for 50% of electricity energy generation, and the majority of natural gas is provided by only two nations. To mitigate this danger, it is vital to diversify the resources used in electrical energy generation and lower the percentage of natural gas by giving preference to local resources (Çalışkan, 2009).

In the 2002-2020 period, primary energy demand increased by 87.3 percent and imports of energy inputs increased by 101.9 percent, while the increase in domestic energy supply lagged behind the increase in demand and imports. Coal comes first in energy supply, followed by oil and natural gas. The total of fossil fuels is 83.5 percent, and the share of renewable resources is 16.5 percent. In other words, renewable energy resources account for barely one-sixth of primary energy

supply. Energy consumption reached its highest point in 2017 and decreased in 2018 compared to 2017 (MMO, 2021).

The share of domestic resources in the energy supply is 31 percent, and 69 percent of consumption is based on imports. The 2019 energy raw materials import bill was $41.6 billion. Due to factors such as the great fall in oil prices, the decline in natural gas prices, and the decrease in energy demand due to the epidemic, the import bill of energy raw materials in 2020 is expected to be around 30 billion dollars (Çetin & Yağız, 2020).

The Fatih drill ship from Türkiye discovered 320 billion cubic meters of natural gas in the Tuna-1 field in the Black Sea in 2020. With this move, Türkiye aims to reduce the foreign dependency ratio for natural gas from 72 percent to 69 percent (Çiğdem Münibe Alyanak, 2020). Türkiye consumes 45-50 billion cubic meters of natural gas annually, and almost all of it is met through imports from abroad. Therefore, the binary method is followed in imports. Natural gas is purchased from Russia, Iran and Azerbaijan through pipelines with long-term contracts. 30 billion cubic meters are purchased annually from Russia (based on contract amount), 6.6+2.6 billion cubic meters from Azerbaijan, and 9.6 billion cubic meters from Iran.

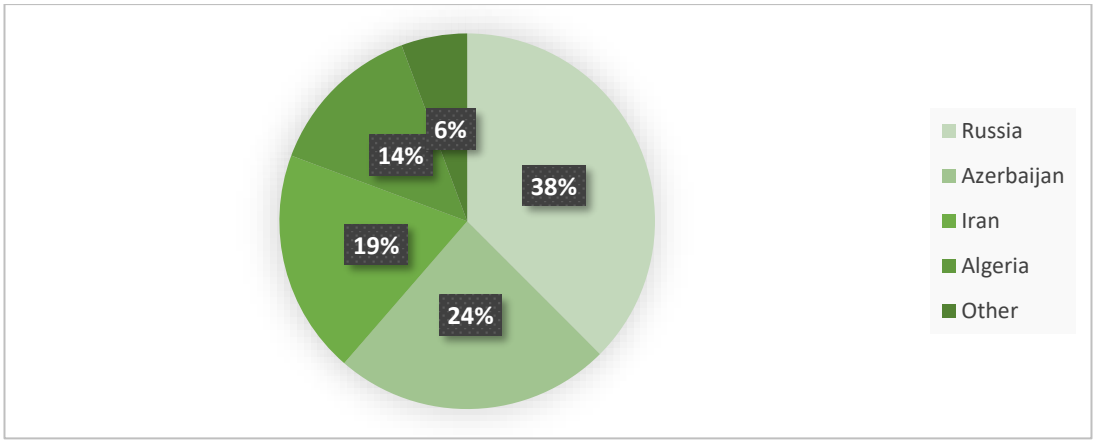


**Figure 1-4. Natural Gas Imports by Country**

**Source:** Türkiye Petrolleri, 2020, p. 14.

Finally, Türkiye aims to reduce its "dependence" on foreign countries and suppliers, especially Russia, the USA and Iran, with the possible gas production in

the Black Sea. Every year, Türkiye transfers an average of 50 billion dollars abroad for natural gas imports. This dependency hits the economic balances heavily (Sözcü, 2021).

### 1.2.3. Energy Strategies of Türkiye

While the Cold War period, which ended with the dissolution of the Soviet Union in 1991, affected the foreign policy vision of many countries, it caused the reshaping of the national security policy of Türkiye, which has geostrategic importance.

The demand for energy in Türkiye is increasing as a result of the country's structural and economic growth. Despite the fact that it lacks abundant energy resources, Türkiye has a fast expanding market. It is located in an area that has 71.8% of the world's proved gas reserves and 72.7% of the world's proven oil reserves, encompassing the Middle East and the Caspian Basin (Efegil & Özsavaş, 2020). As a result, Türkiye serves as a natural link between source nations and consumer markets, and it is a significant player in guaranteeing energy security through source and route diversification. These concerns are becoming increasingly important in Europe today. Türkiye also aspires to be a regional energy commerce hub, contributing to regional and global energy security. The following are the primary factors that comprise the international dimension of the Ministry of Energy and Natural Resources' energy strategy (T.C ETKB, 2021):

- To assure oil and natural gas supply route and resource diversification, taking into consideration rising demand and foreign dependency,
- To help ensure regional and global energy security,
- To be a regional energy trade center,
- Consider the social and environmental ramifications of sustainable development at every level of the energy cycle.
- To enhance the proportion of domestic and renewable energy used in power generation,
- Incorporating nuclear energy into the mix.

*"Reducing foreign dependency on energy resources, especially natural gas and oil"* is one of the strategic goals of the Ministry of Energy and Natural Resources. The Strategic Plan laid the foundations for nuclear power plant construction in 2018 (Tiftikçigil & Yesevi, 2015). The Akkuyu Nuclear Power Plant, among the largest investments in Türkiye, will consist of 4 reactors, each with a 1200 megawatts (MW) capacity. While the first power plant unit is planned to be completed and commissioned in 2023, the plan is to start operating at full capacity as of 2026, with the other units being put into operation one year apart. When the Akkuyu NPP comes into operation at full capacity, it is aimed to meet 10 percent of Türkiye's annual electricity demand with approximately 35 billion kilowatt-hours of electricity production (Cevrioğlu, 2021).

In 2019, roughly 474 million Sm3 of natural gas was produced and sold in the nation. Türkiye, on the other hand, utilized 45.3 billion Sm3 of natural gas. Therefore, the foreign dependency ratio in natural gas was 98.95 percent. In 2019, crude oil production was approximately 20 million 750 thousand barrels, and consumption was 50 million tons. Foreign dependency on oil was at the level of 96 percent. Oil production increased by 1.5 million barrels in 2020. In addition, another target of Türkiye is to process and supply the 320 cubic meters reserve in the Danube-1 field off Zonguldak by 2030 and to reduce the current account deficit due to natural gas. According to 2019 figures, this reserve aims to meet Türkiye's natural gas consumption for seven years (EPDK, 2021)

Türkiye's energy needs increase rapidly, and hydrocarbon fuels occupy the largest share of primary energy consumption. For this reason, the distribution of these resources force countries with resources, market countries and countries through which these resources pass, and international oil companies to cooperate with Türkiye (EPDK, 2021).

### 1.3. Türkiye's Energy Resources

Fossil resources meet a large part of the energy need worldwide. The regeneration of fossil resources takes a very long time, which has made using these resources exhaustible. The most basic fossil resources are oil, coal, and natural gas. Apart from these, nuclear energy is also included in this class since radioactive

elements are consumable. These fuels used extensively in daily life are defined as fossil or classical energy resources. Especially in the last two centuries, fossil fuels have found widespread use due to their affordability and the developments in production technology.

Türkiye is insufficient in terms of meeting its capacity with current reserves. Fossil-based energy resources include asphaltite, lignite, hard coal, crude oil, bituminous schists, natural gas, thorium and uranium, and many renewable resources such as solar, geothermal, wind, hydraulic and biomass. Natural gas resources and oil reserves determined as a solution to Türkiye's energy problem are not at a sufficient level for consumption. To meet the increasing need for energy in parallel with the increasing population, economic development and developing economy in Türkiye, the importation rate of foreign resources should be reduced, and incentive policies should be introduced to produce existing domestic resources.

Fossil energy resources do not constitute much of Türkiye's energy potential. Although there are rich oil and natural gas deposits in the Middle East and the Caucasus, Türkiye's energy resources are not very common due to their geological characteristics. The same is true for coal. Türkiye can only meet its own needs through lignite reserves out of fossil energy resources. Türkiye's identified fossil fuel reserves are 11,444.9 million tons of lignite, 1,334,6 million tons of hard coal, 6.2 billion $m^3$ of natural gas, and 44.3 million tons of oil. These figures alone prove that Türkiye meets its own needs through lignite reserves (Yılmaz, 2021).

In terms of consumption, natural gas has the largest primary energy consumption share, with 32.2% (36,909 thousand TOE). Natural gas is followed by coal with 31.3% (35,841 thousand TOE), oil with 26.6% (30.499 thousand TOE), hydraulic with 3.9% (4.501 thousand TOE), biomass with 3% (3,573 thousand TOE). Other renewable resources follow with 0.5% (1,712 thousand TOE) and geothermal heat with 1,3% (1,463 thousand TOE). Therefore, the share of fossil resources is 90.2%, and the share of renewable energy resources is 9.8% (Koç & Kaya, 2021).

### 1.3.1 Coal Reserves

In terms of coal resources and output, Türkiye ranks middle in lignite and low in hard coal on a global scale (anthracite). Türkiye has 8.7% of the total global lignite resources, 3.6% of the entire world lignite and sub-bituminous coal resources, and about 2.1% of the overall world coal resources, including anthracite (Enerji ve Kömür, 2022).

Zonguldak and its environs contain the majority of Türkiye's hard coal deposits. According to MTA statistics, the hard coal reserve is 1.52 billion tons, with 736 million tons visible. The combined lignite and asphaltite reserve is 19.14 billion tons, with a total coal resource of 20.66 billion tons. Because one-third of Türkiye's coal resources have been studied and feasibility assessments conducted, only a small number of them are classified as reserves. There has been a large increase in coal resources as a consequence of recent exploration and reserve development studies. Türkiye's total coal reserves are estimated to be 20.84 billion tons (MTA, 2020; TKİ, 2020). Lignite accounts for about 19.32 billion tons of our entire 20.84 billion tons of coal reserves.

The entire geological reserve (resource) discovered in the basin exploration efforts up to -1200 m depth is 1,518 billion tons, of which about 48% is deemed "visible." Türkiye possesses around 2.1% of the world's total coal reserves and is notable in terms of lignite. The fact that 79% of lignite has a heating value of less than 2500 kcal/kg, on the other hand, has emphasized its usage in thermal power plants. In recent years, thermal power plants have utilized around 85% of the approximately 70,000,000 tons of output. The installed capacity of lignite-based thermal power plants is 8.515 MW, accounting for 23.6% of total installed capacity. It seems possible to increase the installed power by 20,000 MW with the rapid commissioning of the lignite fields, whose reserves are determined and where thermal power plants can be established, and the addition of new units to the known ones (Enerji Atlası, 2022).

Of the total domestic coal supply of 16.6 MTOE, 15.1 MTOE is lignite, 0.7 MTOE is hard coal, and 0.7 MTOE is asphaltite. The imported coal supply is at the level of 24.5 MTOE. In 2018, the annual increase in domestic coal supply based

on calorific value was 8.8%, and the decrease in imported coal supply was 1.7%. While domestic coal production met 16% of energy consumption in 2008, it became 11.5% in 2018 within only a decade. Therefore, in 2018, 81.1 million tons of lignite, 1.1 million tons of hard coal and 1.8 million tons of asphaltite amounted to 84 million tons of salable coal (Tamzok, 2019).

The coal consumed in Türkiye in 2018 was 122 million tons, with 39.5 million tons of domestic or imported hard coal and 82.5 million tons of lignite and asphaltite. Compared to the previous year, hard coal consumption increased by 1.7% and lignite consumption by 12.9% in 2018. The increase in total coal consumption is at the level of 9.1% (TMMOB, 2021).

Türkiye's lignite coals generate energy in thermal power plants, industrial sectors, and residential and commercial buildings for heating. Therefore, 60.2% of the hard coal supply in 2018 was consumed for electricity and heat generation and 8.9% for heating purposes. The share of power plants in hard coal production is gradually increasing. The said share, which was 20% ten years ago, has reached 60% as of 2018 (TMMOB, 2018).

As of the end of 2019, the installed power of coal-based power plants has increased to 20,284 MW, corresponding to 22.2% of the total installed power. Among the total installed power, the domestic coal-based installed power is 11,317 MW (12.4%), and the imported coal-based installed power is 8,967 MW (9.8%). In 2019, 113 TWh of electricity was produced from coal-based (including asphaltite) power plants, and its share in the total generation is 37.6%. 52.5 TWh of this amount belongs to domestic coal (including asphaltite). The share of domestic coal in total gross electricity generation was 17.4% in 2019. Imported coal in electricity generation based on the share of power plants is 20.1% with 60.5 TWh (Tamzok, 2019).

Türkiye's hard coal production decreased to 1 million 65 thousand tons in 2020. It is stated in the "Coal (Lignite) Sector Report of the Turkish Coal Enterprises" that the decline in production is due to the pandemic. According to 2020 data, 12% of electricity production in Türkiye is met by thermal power plants that burn lignite coal. The share of imported coal-fired power plants in electricity

generation is 20%. While domestic coal production decreased in 2020, imported coal consumption increased. Half of the imported hard coal was burned in thermal power plants. The use rate of imported coal in thermal power plants was 20% a decade ago (IEA, 2021).

Coal has an important place in sustainable energy development plans due to its indispensable position in electrical energy and steel production in developed and developing countries. From the perspective of Türkiye, Türkiye's total hard coal reserves are insignificant, with a share of 0.14% compared to the global hard coal reserves. Although Türkiye's total hard coal reserves are less than China's one-year production, considering the country's current and probable hard coal consumption values, it can be concluded that Türkiye's hard coal assets are not insignificant (Küçükönder, 2014).

### 1.3.2 Oil Reserves

Türkiye is classified as "energy intensive" in primary energy intensity (Tiftikçigil & Yesevi, 2015). Türkiye has a primary energy supply of 153.5 million tons of oil equivalent (MTOE). While oil ranks first with a share of 48.6% of the total supply, natural gas takes second place with a share of 40.7%. According to Türkiye's primary energy demand forecasts, the total energy demand for 2023 is expected to increase by 90% from 153.5 MTOE to 218 million MTOE compared to 2018. According to this very exaggerated estimation, which predicts a linear increase of 7% per year, the share of oil demand in total energy consumption is predicted to be 26% in 2023. In 2018, approximately 54,386 barrels/day of crude oil was produced in Türkiye. The daily oil consumption was 793 thousand barrels in 2018, and the ratio of domestic crude oil production to meet the total consumption was 8% (Özdemir, 2019).

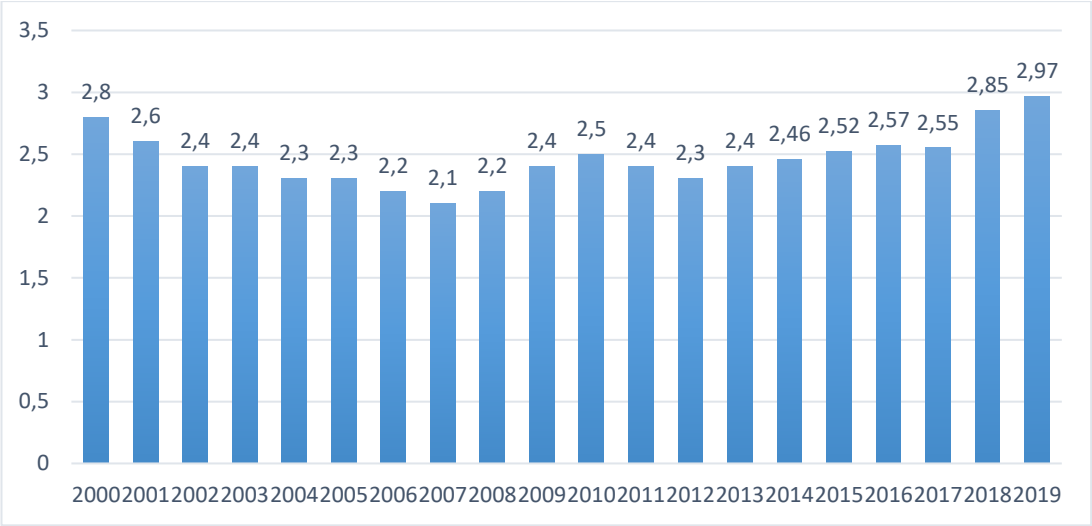


**Figure 1-5. Amounts of Crude Oil Produced in Türkiye**

**Source:** BP, Statistical Review of World Energy, 2019.

In 2018, Russia ranked first in Türkiye's oil imports with a share of 25%, followed by Iran with a share of 18% and Iraq with a share of 17%. In 2019, the countries in the top three changed. Russia maintained its leadership, followed by Iraq ranking second and Kazakhstan ranking third. Iran's share in Türkiye's total oil imports decreased remarkably compared to last year, while Russia's share increased. Iraq's share increased by 2.95% compared to the previous year. Accordingly, in 2019, approximately 35.4% of the oil imported by Türkiye was obtained from Russia, 21.3% from Iraq and 7.1% from Kazakhstan, while this amount was followed by India with 6.9%. The other countries 4.7% Iran, 4.4% Saudi Arabia, 4.4% Nigeria, (4.1%) Israel, (3.4%) Libya, (2.5%) Bulgaria, (2.1%) Greece, (1.7%) Turkmenistan and (1.1%) are other prominent countries (BP Statistical Review of World Energy, 2019).

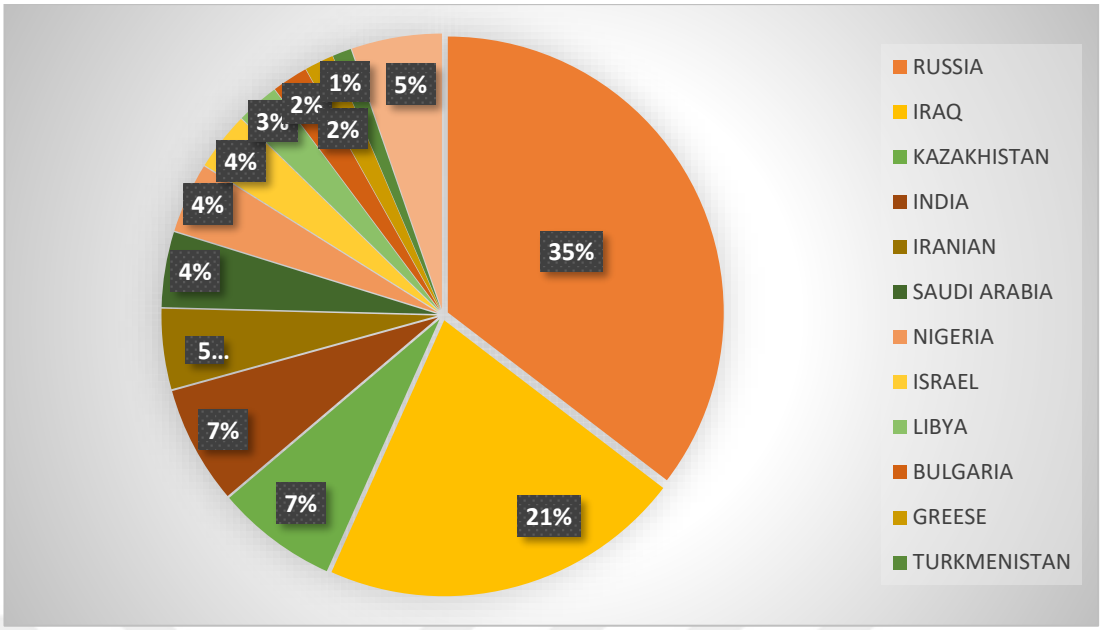


**Figure 1-6. Distribution of Crude Oil Imported by Türkiye in 2018 by Countries, %**

**Source:** EPDK, 2018a.

*'In the 2015-2019 Strategic Plan prepared by the MENR, the target is to increase the consumption coverage ratio of domestic and international crude oil production to 13.6%, to increase domestic crude oil production to 18.8 million barrels in 2019 and reach 19.1 million barrels in 2023.''*

While crude oil production was 20 million 750 barrels in 2019, it reached 22 million 269 thousand barrels in 2020. Therefore, Türkiye's oil production increased by 1.5 million barrels in 2020. (IEA, World Energy Outlook, 2021)

Based on 2020, crude oil production has exceeded the 2023 target prepared according to the 2015-2019 Strategic Plan.

Türkiye is not a country rich in oil deposits. Existing oil deposits are mostly in Adıyaman, Diyarbakir and Batman in the Southern Anatolian Region. However, there are oil fields in Siirt, Şanlıurfa and Mardin. Therefore, the oil produced meets 7.1% of Türkiye's needs (Tokcan & Gülmez, 2021).

There are four refineries operating in Türkiye: İzmir (Aliağa Refinery), İzmit and Kocaeli (İpraş Refinery), Kırıkkale (Central Anatolia Refinery) and Batman

(Batman Refinery). Oil is extracted only in Batman because 99% of Türkiye's oil reserves are in Batman (Tokcan & Gülmez, 2021).

According to Melih Han Bilgin, General Manager of Turkish Petroleum Corporation (TPC), who conducts investigations on the oil fields in Batman, the oil wells on the border will be TPC's new production fields. Although oil exploration is not an activity carried out only on land, 16 offshore wells were successfully completed in 2021, 8 of which were in the Mediterranean, together with the Black Sea. Very important gas discoveries were made in the gas fields in the Black Sea and Sakarya. In addition, TPC plans to increase its daily oil production to 65,000 barrels with other regions, including the 50 thousand barrels in the Batman region. It also aims to reach the highest drilling of all times with 150 exploration wells (Arslan, 2021).

Some of the crude oil produced in the Southeastern Anatolia Region is sent to the Batman refinery and some to Dörtyol via the Batman-Iskenderun pipeline. It is then transported to Izmir and Izmit refineries by tankers. Crude oil is transferred to the Central Anatolia Refinery via the pipeline between the İskenderun and Kırıkkale. In addition, some Iraqi oil is transported to the Yumurtalık Port via the Türkiye-Iraq pipeline. Türkiye generates a significant income from this transportation. Azerbaijani oil is also transported to Iskenderun Bay via the Baku-Tbilisi-Ceyhan Pipeline. It will be explained in more detail in the next chapter.

| REFINERY NAME | REFINERY CAPACITY (TONS/YEAR) | AMOUNT OF CRUDE OIL PROCESSED (TONS) | | | CAPACITY UTILIZATION RATES (%) | | |
|---|---|---|---|---|---|---|---|
| | | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 |
| IZMIT | 11,000,000 | 9,025.95 | 9,557,924 | 8,993.02 | 82,1 | 86,9 | 81,8 |
| IZMIR | 11,000,000 | 8,061.49 | 8,544,409 | 7,863.46 | 73,3 | 77,7 | 71,5 |
| KIRIKKALE | 5,000,000 | 2,955.05 | 3,040,175 | 3,231.02 | 59,1 | 60,8 | 64,6 |
| BATMAN | 1,100,000 | 945,62 | 975,623 | 1,005.67 | 86 | 88,7 | 91,4 |
| TOTAL | 28,100,000 | 20.988.10 | 22,118,131 | 21,093.18 | 74,7 | 78,7 | 75,1 |

**Figure 1-7. TÜPRAŞ Installed Capacity and Capacity Utilization Rates in the Refinery Sector**

**Source:** EPDK, 2019a.

As of 2019, the Izmit Refinery of TÜPRAŞ reached a capacity of 11.3 million tons/year, with the Izmir Refinery reaching a capacity of 11.9 million tons/year and the Kırıkkale Refinery 5.4 million tons/year as a result of significant capacity increases, transformations and unit modernization investments made over the years. The capacity of Batman Refinery was registered as 1.4 million tons/year after the heat exchanger investments (EPDK, 2020).

### 1.3.2.1 Oil Pipelines in Türkiye

Türkiye is a transit country between producers and consumers in the Middle East, Caspian Region, Central Asia and the world, especially in Europe. Türkiye is an important market for oil-producing countries and is in a transit position in the transportation of oil pipelines between Asia and Europe, the Middle East and Europe.

In this context, the existing and planned oil pipelines in Türkiye are as follows:

- Baku-Tbilisi-Ceyhan Crude Oil Pipeline (BTC)
- Iraq-Türkiye (Kirkuk-Ceyhan/Yumurtalık) Crude Oil Pipeline
- Samsun-Ceyhan Crude Oil Pipeline

Baku-Tbilisi-Ceyhan Crude Oil Pipeline (BTC):

Through Türkiye, this pipeline transfers oil mined from the Caspian Sea to the global market. The BTC line is the world's second longest pipeline, measuring 1,776 kilometers in length. The pipeline spans 249 kilometers in Georgia, 443 kilometers in Azerbaijan, and 1,076 kilometers in Türkiye. The pipeline's diameter is 42 inches (106.68 centimeters) across Azerbaijan and Türkiye. In Georgia, it is 46 inches (116.84 centimeters). In the final section towards the Ceyhan Marine Terminal in Türkiye, the pipeline's diameter decreases to 34 inches (86.36 centimeters) due to the inclination (Akpınar, 2015).

The BTC Crude Oil Pipeline connects the Sangachal Terminal in Baku, Azerbaijan, with the Ceyhan Terminal on Türkiye's Mediterranean coast. BTC accounts for 90% of Azerbaijan's oil exports.

In its annual report, BP Azerbaijan stated that 27.8 million tons of crude oil were exported in 2020 through the BTC (Baku-Tbilisi-Ceyhan) pipeline, which transports Azerbaijani natural gas to Europe via Türkiye (Bal & Alper, 2010).

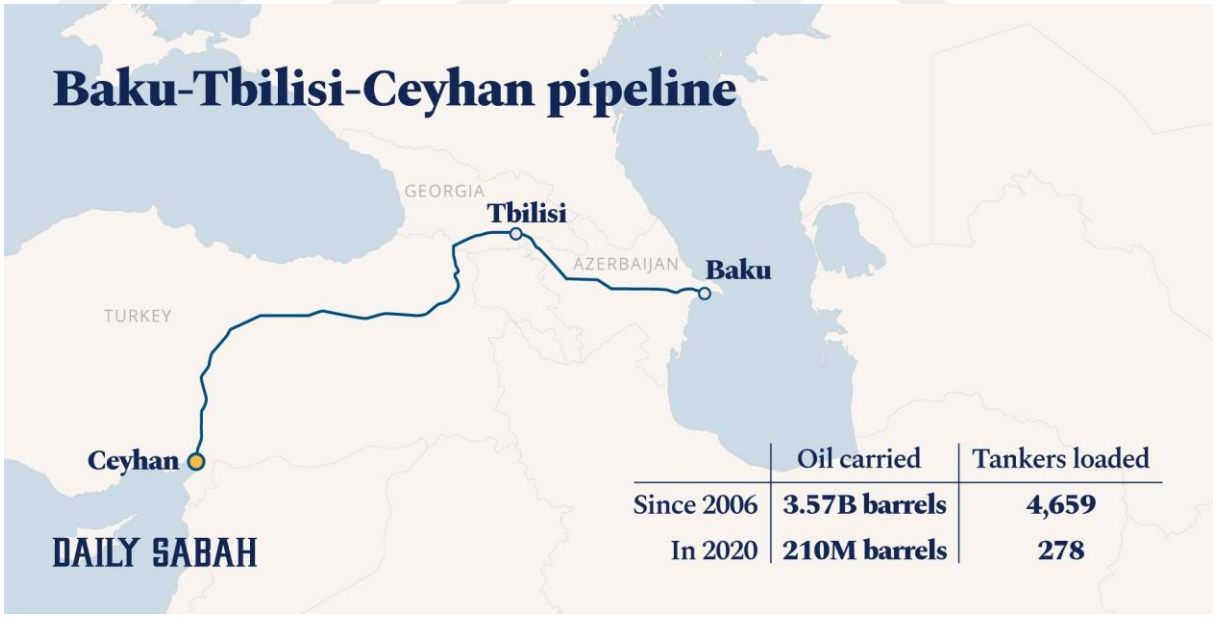


**Figure 1-8. Baku-Tbilisi-Ceyhan Crude Oil Pipeline (BTC)**

**Source:**https://www.dailysabah.com/business/energy/caspian-oil-flow-through-baku-tbilisi-ceyhan-pipeline-reaches-35b-barrels-at-end-of-2020

The capacity of BTC is 1 million barrels/day. The first oil from the BTC pipeline was loaded onto the tanker in Ceyhan on June 4, 2006. In addition, BTC has delivered more than 475 million tons of crude oil via 4,659 tankers since June 2006, when it started operations, until the end of 2020.

Iraq-Türkiye (Kirkuk-Ceyhan/Yumurtalık) Crude Oil Pipeline:

The Iraq-Türkiye Crude Oil Pipeline consists of two parallel lines. It transports the crude oil obtained from Kirkuk and other production fields from the North of Iraq to the Ceyhan (Yumurtalık) Marine Terminal. The pipeline, which has an annual transport capacity of 35 million tons, was commissioned in 1976 and the first line actually carried out the first tanker loading on May 25, 1977. With the I. Extension Project, which started in 1983 and completed in 1984, the capacity of the line was increased to 46.6 million tons. With the Second Pipeline, which is parallel to the First Pipeline and put into operation in 1987, the annual transport capacity has reached 70.9 million tons. The first line is 986 km in total, 354 km of which is in Iraq and 641 km is in Türkiye. The total length of the second line is 890 km, of which 234 km is in Iraq and 656 km in Türkiye (BOTAŞ, 2022).

BOTAŞ owns the part of the line remaining in Turkish territory. The operation, control, maintenance and repair of this part of the line also belongs to BOTAŞ.

Samsun-Ceyhan Crude Oil Pipeline:

Completing the BTC project, Türkiye opted to support the Samsun-Ceyhan Crude Oil Project, which is critical in turning Türkiye's geostrategic location into a strategic advantage and improving its position in the international energy market. This project is crucial for Türkiye in terms of reducing the tanker traffic in the straits and thus ensuring the environment and strait security. In addition, this project is being developed by the Trans Anadolu Pipeline company, which was formed by the Italian Eni Company and the Turkish Çalık Enerji company with a 50% partnership. The Italian Eni Company has an 18% investment in the partnership in Kazakhstan's Kasagan Oil field. The main source of the Samsun - Ceyhan Pipeline project is considered to be this oil. According to the project, the line extending from Samsun to Kırıkkale will be connected to the existing Kırıkkale - Ceyhan line from here.

The length of the line is approximately 552 km. It is predicted that the annual gaining capacity will be 70 million tons (Peker & Gümrah, 2007).

### 1.3.3 Natural Gas Reserves

Türkiye's population growth and growing economy have followed an upward energy demand trend over the years. However, Türkiye is a country with a high dependence on imported inputs in energy. As a structural problem, this situation puts pressure on Türkiye's current account deficit and jeopardizes energy supply security. In this framework, Türkiye follows nationalization and diversification policies in energy resources. Especially in the electrical energy produced using renewable energy resources, there have been serious capacity increases with the private sector-public sector cooperation (Sakal, 2020). From 2010 to 2021, energy production from renewable resources in Türkiye has nearly tripled (IEA, 2021).

Türkiye is a country that is almost completely dependent on imported inputs for the natural gas it consumes. On the other hand, Türkiye's natural gas production has been increasing over the years. The inadequacy of domestic natural gas resources in Türkiye against the increasing energy demand brings about an increase in imports of natural gas. Türkiye is one of the countries that import the highest amount of natural gas globally. Türkiye imported 45,211 million cubic meters of natural gas and exported 763 million cubic meters of natural gas in 2019 (Table 1). Türkiye is a country that demands more natural gas than it produces. Türkiye's natural gas production, which was 381 million cubic meters in 2015, increased to 474 million cubic meters in 2019 (EMRA, 2020). In addition, with the breakthroughs Türkiye has made in the recent period, it has accelerated its natural gas exploration and extraction activities. Especially after 2020, the total volume of natural gas found in the Danube-1 and Amasra-1 wells in the Black Sea region is approximately 405 billion cubic meters (Konak, 2020).

Türkiye imported 48,125,51 million Sm3 of natural gas in 2020, according to the Energy Market Regulatory Authority (EMRA) Natural Gas Market 2020 sector report. Natural gas imports increased by 6.45% compared to 2019. In 2020, imports were mostly made from Russia with a share of 33.59%, followed by Iran with 11.06%, Azerbaijan with 24% and Algeria with 11.58% (EMRA, 2021).

According to the strategic plan of the Ministry of Energy and Natural Resources, the aim is to increase the number of offshore drillings to be conducted by the public sector in the Mediterranean and Black Seas to 11 in 2020, 17 in 2021, 24 in 2022 and 28 in 2023. The Ministry plans to carry out three-dimensional seismic exploration and produce 1.714 million cubic meters of natural gas in a total area of approximately 56,700 square kilometers in 2021. The natural gas production target for 2023 has been determined as 4.929 million cubic meters (approximately 5 billion cubic meters) (T.C. ETKB, 2021).

The inadequacy of domestic natural gas resources in Türkiye against the increasing energy demand brings about increases in natural gas imports. Türkiye imports the highest amount of natural gas globally. With the breakthroughs Türkiye has made in the recent period, it has accelerated its natural gas exploration and extraction activities. Especially after 2020, it has greatly increased its known and usable natural gas capacity with the reserves found in the Danube-1 and Amasra-1 wells in the Black Sea region.

Türkiye's natural gas consumption reached a record level of 53,857 million cubic meters in 2017, and the consumption volume decreased by 8.4% and 8.2%, respectively, in 2018 and 2019 compared to the previous year. Power plants, which have been in the first place in the distribution of natural gas consumption by sectors for many years, ranked third in natural gas consumption after the residential and industrial sectors as of 2019. The natural gas consumed by the power plants was 11.3 billion cubic meters, 12.4 billion cubic meters by the industrial sector, and 14.4 billion cubic meters by the housing sector in 2019 (Umutlu & Bayraç, 2020).

#### 1.3.3.1 Natural Gas Pipelines in Türkiye

The following natural gas lines exist and are planned in Türkiye. More detailed information will be given in Chapter 3 regarding the required natural gas pipelines.

- Russian Federation Türkiye Natural Gas Main Transmission Line
- Eastern Anatolia Natural Gas Main Transmission Line
- Samsun - Ankara Natural Gas Main Transmission Line (Blue Stream)

- Türkiye-Greece Natural Gas Pipeline
- Baku-Tbilisi-Erzurum Natural Gas Pipeline (BTE)
- TANAP (Trans Anatolian Pipeline Project)
- TurkStream Project

The 842-kilometers long Russian Federation-Türkiye Natural Gas Pipeline reaches Ankara through the Malkoçlar entry point by following the route of Hamitabat, Ambarlı, Istanbul, Izmit, Bursa, and Eskişehir. The pipeline has compressor stations in Kırklareli, Ambarlı, Pendik, Bursa and Eskişehir and the main metering station in Malkoçlar (T.C ETKB, 2021).

Eastern Anatolia Natural Gas Main Transmission Line:

This project aims to transport natural gas from the resources in the east, especially Iran, to Türkiye via pipeline. The East Anatolian Natural Gas Main Transmission Line, which is approximately 1,491 km in length and varying in diameter between 48" and 16", starts from Doğubayazıt and extends to Ankara via Erzurum, Sivas and Kayseri. A branch reaches Seydişehir via Kayseri, Konya (T.C ETKB, 2021).

Samsun - Ankara Natural Gas Main Transmission Line:

Also known as the Blue Stream Project, the pipeline starts from Samsun in Türkiye and reaches Ankara via Amasya, Çorum and Kırıkkale. Following the completion of the construction works, the system was commissioned in 2003, and the gas shipments from Russia started (T.C ETKB, 2021)

Türkiye-Greece Natural Gas Pipeline:

The Türkiye-Greece Natural Gas Pipeline has a diameter of 36” and a total length of 296 km. 211 km pass through Türkiye and 85 km through Greece. The pipeline enters Greece at the Ipsala border point and ends in Komotini. Natural gas exports from Türkiye to Greece started in 2007 with the said pipeline (BOTAŞ, 2022).

Baku-Tbilisi-Erzurum Natural Gas Pipeline (BTE):

The Phase-I part of the Azerbaijan-Türkiye Natural Gas Pipeline Project is approximately 113 km and has a diameter of 42" starting from the Türkiye-Georgia border in the Posof district of Kars province. This phase was completed on 30.12.2006, and gas was provided to the province of Ardahan (BOTAŞ, 2022).

The Phase-II part of the Azerbaijan-Türkiye Natural Gas Pipeline Project is 113 km and starting from the end point of the 42” diameter line within the scope of Azerbaijan-Türkiye Natural Gas Pipeline Project Phase-1 and extending in Erzurum-Horasan direction 09.03.2007 and gas supply was provided to the province of Kars (Bal & Alper, 2010).

TANAP (Trans Anatolian Pipeline Project):

It is planned to transport 6 billion cubic meters of natural gas per year from Azerbaijan's Shah Deniz field to Türkiye and 10 billion cubic meters per year to Europe (BOTAŞ, 2022).

On June 30, 2018, the work to link the TANAP Line to the BOTA transmission system was finished, and natural gas delivery to our country commenced. The Phase-1 leg of the project between Eskişehir and Edirne/Ipsala is complete and ready for gas supply to Europe.

### 1.4 Türkiye’s Nuclear Energy

Nuclear energy in Türkiye has a long and complicated history. The efforts of research and development and building a power plant over the years have come to the present, with the Akkuyu Nuclear Power Plant under construction recently becoming tangible. This process lasted 50 years and caused Türkiye to fall behind in nuclear energy compared to many developed countries forcing the country to meet its energy needs in other ways over the years.

Like many other countries, Türkiye's adventure with nuclear energy started with the 1st Environment Conference, which held the "Using Atomic Energy for Peaceful Purposes" conference in 1955.

The Nuclear Research and Training Center in Çekmece was established after the conference in 1961for education and basic research purposes, and a 1MW experimental reactor was put into operation.

The first feasibility studies on nuclear power plants, designed for electricity generation, started in 1968. The feasibility studies and ground surveys were revised according to changing conditions between 1972-74. Akkuyu was deemed suitable as the first establishment site in 1976, based on extensive studies, and a ground license was obtained from the Presidency of the Atomic Energy Commission. The first tender attempts were initiated in 1976. After evaluating the incoming bids, an agreement was reached with Asea-Atom and Stal-Laval companies in 1977 and pre-contract negotiations were given a start. Still, the negotiations were terminated on 12 September 1979 for various reasons.

Bids were collected from Atomic Energy of Canada Limited (AECL), Siemens-Kraftwerk Union and General Electric companies in 1982 through the Presidency of the Turkish Atomic Energy Agency. Although an agreement was reached with these companies in 1984, the companies withdrew from the tender due to the government changing some of the terms of the agreement. In 1983, the Nuclear Power Plants institution: NESLAK decree was prepared and approved for state institutions to work in an organized manner. Even though Kenan Evren, the president of the period, announced that three different types of nuclear power plants would be established in Türkiye, the NESLAK decree was never implemented. While the ongoing negotiations with AECL were terminated in 1985 due to some financing disputes, the Chernobyl nuclear power plant explosion in the Soviet Union in 1986 caused Türkiye's work on nuclear power plants to be suspended for a little longer (T.C ETKB, 2022).

In 1992, letters were sent to major companies and bids were requested with the nuclear energy studies starting again for constructing a 1000 MW power plant, which would be activated in 2002. In December of the same year, Mehmet Ersin Faralyalı, the Minister of Energy in his report, predicted that if new energy resources were not allocated to the country, there would be an energy crisis in the country in 2010. It was emphasized in the same report that nuclear energy could play an important role in preventing this crisis. Thereupon, the Supreme Council of

Science and Technology declared energy production from nuclear energy as the third most important issue in the country and accelerated its work again. However, neither the agreements made with the South Korean company Kaeri in 1995 nor the negotiations with AECL, NPI and Westınghouse in 1997 were concluded. In 2000, the government ended the negotiations and announced giving up the establishment of a nuclear power plant in the country.

In 2004, the Minister of Energy and Natural Resources, Hilmi Güler, announced that the studies on nuclear energy had started again. In January 2005, 7 million TL was transferred to the investment budget of Electricity Generation Cooperation and the Turkish Atomic Energy Agency for the three power plants to be established. It was stated that the nuclear power plants construction would start in 2007. After delays, the "Nuclear Energy Law", aiming to establish three nuclear power plants of 5 thousand megawatts between 2010 and 2020, was enacted on January 17, 2007. However, Ahmet Necdet Sezer, President of the period, vetoed three articles of the law because there was unconstitutionality in areas such as the structure of the company that will establish the power plant, its supervision and dismantling costs (ETKB, 2021).

"*On May 12, 2010, a Cooperation Agreement which was signed between the Russian Federation and the Republic of Türkiye envisages the construction of the Akkuyu Nuclear Power Plant with a total installed power of 4800 MW, with four power units with VVER-1200 reactors, in the district of Gülnar of the province of Mersin on the south coast of Türkiye. On 13 December 2010, in accordance with the terms of the agreement, the Russian side established the project company Akkuyu Nuclear Incorporated Company in the Republic of Türkiye. ROSATOM's share in the project is 99.2%. The total cost of the project is around 20 billion USD* (T.C ETKB, 2022)*.''*

The first turbine of the Akkuyu Power Plant, which is under construction today, is expected to start generating energy in 2023. In addition, an agreement was reached on constructing the Sinop Nuclear Power Plant after Japan visited Türkiye on May 3, 2013. According to the terms of the agreement, a consortium consisting of Japan, France and Türkiye would be in charge of operating it.

However, in an interview given to journalists by Turkish President Erdogan on 27 June 2019, stating that the costs of the nuclear power plant in Sinop had doubled and that the power plant could not be built in the current situation, he also stated that the project had been suspended (T.C ETKB, 2022).

On the other hand, Ali Rıza Alaboyun, the Minister of Energy and Natural Resources back in 2015, said that the third nuclear power plant would be built in Iğneada. Thereupon, Demirköy Mayor Muhsin Yavuz claimed that the locals did not want the power plant and that there were legal obstacles to its construction. Later, Veysel Eroğlu, the Minister of Forestry and Water Affairs, stated that the construction of a nuclear power plant in Iğneada is not on the agenda and that there is no work on it. Details about the Akkuyu Nuclear Power Plant project will be explained in Chapter 3.

### 1.4.1 Uranium and Thorium Reserves in Türkiye

Uranium, a radioactive element, is not found freely in nature. It constitutes uranium minerals combined with various elements. One can find trace amounts in almost every type of rock. Under the necessary conditions, uranium minerals can easily dissolve above the groundwater layer and travel long distances in the form of uranyl ions through groundwater. When they encounter reduction conditions during transportation, they turn into uranium and precipitate as Uranite and Pitchblende, thus forming uranium deposits. The main uranium minerals are uraninite, autunite, pitchblende, torbernite and coffinite (Türkiye uranyum ve toryum yatakları, 2018).

Areas of Use of Uranium:

- As nuclear power plant fuel,
- Uranyl acetate analytical applications,
- Armor plating, ship and aircraft construction,
- To give color to the ceramic,

- In production reactors, to make plutonium hydrogen bombs,
- In the making of nuclear explosives.

According to 2017 data, it has been determined that there is a total of 12,614 tons of uranium reserves in Türkiye. MTA continues its uranium exploration activities in the Nevşehir-Avanos-Yeşilöz area (ETKB, 2021)

**Table 1. Uranium Reserves of Türkiye in 2017**

| AREA | TENOR (%U3O8) | RESERVE (TONS) |
|---|---|---|
| MANİSA-KÖPRÜBAŞI | 0,04-0,07 | 3.487,00 |
| UŞAK-EŞME-FAKILI | 0,05 | 490,00 |
| YOZGAT-SORGUN | 0,1 | 6.700,00 |
| AYDIN-KÜÇÜKÇAVDAR | 0,04 | 208,00 |
| AYDIN-DEMİRTEPE | 0,08 | 1.729,00 |
| TOTAL | | 12.614,00 |

**Source:** MTA, 2017a.

The existing reserves in today's Türkiye remained below the said limits despite having the economic limits accepted by the world in the years sought and found. The main reason is the uranium deposits in Canada and Australia with high grade and low production cost. Türkiye has not started production at a significant level in the known fields yet, nor trade with other countries. However, it is expected that the uranium trade will revive, and production will probably start in Türkiye with the Akkuyu Nuclear Power Plant, which is under construction and will become operational in 2023.

However, thorium is not found in nature in its pure form, but rather in the structure of roughly 50 minerals. Only monazite, thorite, thorianite and allanite are used in thorium production. These minerals are usually found together with rare earth elements (REE, 2021).

Thorium alone cannot be used as a nuclear fuel. Th-232, a fertile isotope, must be converted to U-233, a fissionable isotope, by swallowing a neutron. As a result of the reaction of Th-232 with low-energy neutrons, the less stable Th-233 is

formed. Th-233, on the other hand, transforms into Pa-233 (protactinium) within 23 minutes by emitting a beta particle, and Pa-233 into fissile U-233 within 27 days.

With 846 thousand tons of thorium reserves, India ranks first in the world, according to data from the OECD Nuclear Energy Agency (NEA) and the International Atomic Energy Agency (IAEA). Türkiye ranks second with 790 thousand tons and Brazil third with 606 thousand tons. In addition, according to the International Atomic Energy Agency (IAEA) and OECD data, 11 percent of the world's thorium reserves, with 790 thousand tons, are in Türkiye. Although Türkiye has a significant amount of thorium reserves, the low average grade (2%) and the complexity of the reserve make it difficult to extract thorium alone economically. In Türkiye, extensive exploration studies in the Malatya-Kuluncak-Hekimhan, Kayseri, Sivas, Diyarbakır, and Burdur fields are projected to expand thorium reserves. Türkiye is one of the countries with significant thorium reserves in the world with the exploration works and thorium deposits found. Türkiye has significant potential in thorium, a raw material for nuclear energy, provided that technical problems can be solved. But thorium alone cannot be used as a nuclear fuel. Therefore, for thorium-based energy production, there is a need to establish high-tech facilities that require high investment and operating costs. Although Türkiye does not have a facility to produce thorium, Türkiye does not also have a commercial-scale nuclear reactor that works with thorium as it is. (Konak, 2020)

Thorium must be converted to Uranium-233 to obtain nuclear energy from thorium. U-233 is not easy to transport, purify and safely store its waste. If conditions are provided to reduce risks and technologies can be developed, thorium will be a safe energy source in the future. (Nükleer Enerji, 2021).

### 1.5 Renewable Energy Resources of Türkiye

Renewable energy resources replenish themselves quickly and offer energy constantly, ensuring the world's future.

Renewable energy is crucial in meeting countries' energy demands with domestic resources, lowering dependency on foreign resources, assuring long-term energy usage by diversifying supplies, and limiting environmental impact caused

by energy consumption. Today, approximately 20 percent of the energy consumed worldwide is obtained from renewable resources. Despite the high dependence on fossil fuels in the current situation, the use of renewable energy has been increasing over the years (Karagöl & Kavaz, 2017 ).

Türkiye has made great progress in renewable energy in recent years, keeping up with the worldwide trend. Türkiye's total renewable energy installed power was estimated to be around 35 GW by the end of 2015, with renewables accounting for 11% of overall electricity production. Hydraulic energy accounts for the majority of the installed power. Although resource rates for current renewable energy kinds like wind and sun have increased over time, they are still not at a satisfactory level (Koç, Yağlı, & Uğurlu, 2018).

Renewable energy resources have gained more significance with the depletion of fossil fuels every year, the environmental threats the world is facing, the economic regulations of countries and the demands of being less dependent on other countries. Also known as a clean energy resource, the never-ending options constitute a very important potential for the electrical energy of the future. Türkiye can benefit from all renewable energy resources due to its geographical location and geopolitical status. Especially when compared with EU countries in terms of hydraulic, geothermal, wind and solar energy potentials, it is seen that Türkiye is in an extremely favorable position (Çıtak & Pala, 2016).

Türkiye ranks 5th in Europe and 15th in the world among the countries that created the most renewable energy capacity in 2019. However, although Türkiye's renewable energy capacity is high, the utilization rate of existing energy is quite low. Energy security and efficiency, the negative impact of the volatility in fossil fuel prices on the economy, and foreign dependency force Türkiye to invest in renewable energy. Türkiye attaches particular importance to renewable energy in line with its future plans and the targets set especially for 2023 prove this.

According to estimates, electricity consumption will increase approximately two times in 2023. By 2023, it is foreseen that 30% of Türkiye's total energy

demand will be met from renewable energy sources and the share of natural gas in electricity production will be reduced to below 30%. With the effect of purchase guarantees and the increase in the exchange rate, the number of renewable energy plants that want to benefit from the guaranteed prices within the scope of YEKDEM has increased. In Türkiye, the share of electricity produced from renewable sources (118 514 469 MWh) in 2021 was 35.8%, while the share of electricity produced from fossil sources (212 977 466 MWh) was 64.2%. The main renewable resources in Türkiye in 2021; 16.80% electricity was produced from hydraulic sources, 9.39% from wind, 4.01% from solar, 3.25% from geothermal and 2.30% from biogas.

Renewable energy, which will reduce Türkiye's reliance on foreign energy and its energy bill in the long run, will also provide extremely important benefits in a variety of areas, ranging from national income to employment, investment to environmental factors, energy supply security, and resource diversification for energy supply security. In this way, Türkiye will become a self-sufficient country in energy and be the center country in energy trade (Çalışkan, 2009).

### 1.5.1 Hydraulic

Hydroelectric power plants (HEPPs) convert the power of flowing water into electricity. Hydroelectricity is one of the most important renewable energy resources accepted worldwide. Many countries are looking for ways to use their existing hydroelectric potential most efficiently. Türkiye is rich in terms of its hydroelectric potential, which has not been used with full efficiency in the past.

According to historical statistics, hydraulic resources constitute Türkiye's most important renewable energy resource. The theoretical hydroelectric potential of Türkiye's hydraulic resources is 433 billion kWh. The technically assessable potential is 216 billion kWh, but the economically assessable potential is 140 billion kWh/year. As of the end of 2013, 41% of the potential, measured in terms of economic value, was operational, and 27%, including private-sector projects, was under construction. In 2013, 24.8% of electricity production in Türkiye was obtained from hydraulics. Türkiye's 2023 energy targets include "Using all hydroelectric potential (36000 MW) that can be evaluated technically and economically in electricity generation" (T.C ETKB 23.07.2014).

Türkiye's gross theoretical hydropower potential is 433 billion kWh/year, 216 billion kWh/year technically assessable hydroelectric potential, and 158 billion kWh/year commercially developed potential. With more projects coming online after 2023, this potential is expected to reach around 180 billion kWh/year.

The general state of hydroelectric power facilities is shown in Table 2 of the General Directorate of State Hydraulic Works' 2019 Annual Report (Serdar, 2020, s. 270-275).

**Table 2. General Situation of Hydroelectric Power Plants (As of the end of 2019)**

| HEPP Phase | The number of HEPP | Total Installed Capacity (MW) | Average Annual Production (GWh/year) | Share in Total (%) |
|---|---|---|---|---|
| In operation | 683 | 28.571 | 99.628 | 62,0 |
| Under construction | 47 | 3.636 | 11.962 | 7,5 |
| Construction Not Yet Started | 526 | 15.955 | 48.745 | 30,5 |
| Total | 1.256 | 48.202 | 160.335 | 100 |

**Source:** Türkiye's Energy Outlook, 2020.

### 1.5.2 Solar

The sun's radiation is the principal energy source that influences the planet's physical forms and the atmosphere. Solar energy also helps with the natural completion of the water cycle, culminating in stream power generation. Fossil fuels are solar energy stored in biomass materials. Solar energy is used directly for heating and electricity generation, as it is the source of the bulk of natural energy resources (Güneş, 2019).

Türkiye's installed power of electricity, which was 83,872 MW as of the end of 2017, increased by 5.46% and reached 88,452 MW at the end of 2018 with an additional 4,580 MW. Including the Unlicensed Installed Power, the installed

power of solar energy reached 5,063 MW in terms of source distribution in 2018. The production increase rate between 2017 and 2018 was 5.46% (Kaynar, 2020).

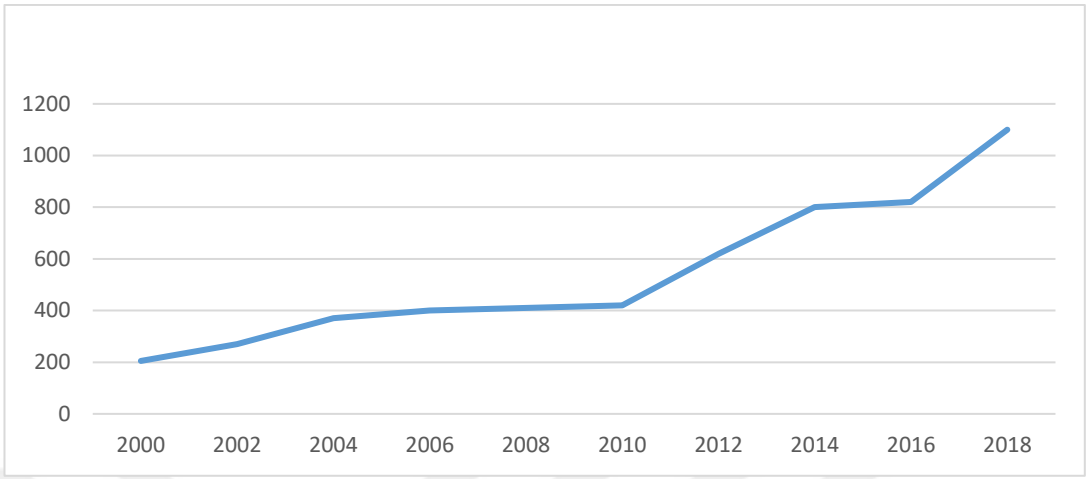


**Figure 1-9. Change of Solar Energy Amounts Used in Türkiye by Years (Billion TOE)**

Source: *T.C ETKB, 2019a.*

According to the Installed Power report published by Türkiye Electricity Transmission Inc. (TETI) in December 2019, the total installed power of the newly established Solar Power Plant (SPP) was 932.3 MW in 2019 completing the year with a total installed power of 5,995 MW (BP, Renewable Energy Section, 2019).

The yearly average solar radiation in Türkiye is 1303 kWh/m2 years, and the average annual sunlight length is 2623 hours, according to the Solar Energy Potential Atlas (SEPA) developed by the General Directorate of Renewable Energy of the Ministry of Energy and Natural Resources. This amount equates to 3.6 kWh/m2 of daily electricity, 7.2 hours of sunlight each day, and 110 days of sunshine. There is a 26.2 million TOE annual energy potential, with 9.8 million TOE for thermal purposes. It may profit technically and economically from 63% of Türkiye's surface area for 10 months and 17% all year (Günder, 2021).

### 1.5.3 Wind

Wind energy is a limitless energy source that is gaining popularity and whose potential has just lately been understood. The International Energy Agency (IEA) has undertaken several studies to assess the worldwide wind energy potential. According to these estimations, the world's onshore technical wind potential is

53,000 TWh/year, assuming that only 4% of locations with wind speeds more than 5.1 m/s are used owing to practical and sociocultural restrictions. Given that global power consumption in 2018 was 26,203 TWh, it is apparent that attempts to make better use of this enormous potential will continue in the future years (Şenel & Koç, 2015).

The General Directorate of Meteorology (GDM) takes wind and other meteorological measurements to evaluate Türkiye's wind energy potential. Although measurements are mostly taken at an altitude of 10 m, there are also measurements taken at an altitude of 30 m. Türkiye's average wind speed on a yearly basis is 2.54 m/s, and wind power density is 24 W/m2, according to measurements performed by GDM at an altitude of 10 m. The data are gathered in one-hour and 10-minute increments, then processed using a software program. Türkiye's wind energy potential has been calculated to be 48,000 megawatts (MW). This potential area equals 1.30 percent of Türkiye's total surface area (Teneler, 2020).

The installed power of Türkiye's wind power plants reached 8 thousand 56 megawatts, with the commissioning of the 687-megawatt power plant at the end of 2018. Therefore, the electricity generation share of Türkiye's wind power plants (WPP) reached 7.46% (Çağatay, 2020).

### 1.5.4 Geothermal

The heat held in the earth's crust creates hot water, steam, and chemical-containing gases, which is known as geothermal. Their energy is also part of geothermal energy since they benefit directly or indirectly from geothermal resources. Being a domestic and green primary energy source, geothermal energy is new, renewable, sustainable, inexhaustible, affordable, reliable, and ecologically beneficial. Geothermal energy can also be obtained from hot, dry rocks devoid of water (T.C ETKB, 2021).

Türkiye is located in a geography where tectonic movements are intense. Many geothermal springs spread all over Türkiye, in the form of natural outflows and at different temperatures. Therefore, geothermal energy is an important renewable energy resource for Türkiye. Each MW of capacity generates more electricity than wind and solar energy (Zaim & Çavşi, 2018).

The installed power of geothermal resources was 1019 MW in the first ten months of 2017. The share of geothermal energy, which was 820 MW in 2016 and had a share of 1 percent in the total installed power, was 1.2 percent in the first ten months of 2017. According to 2019 data, geothermal power plants in Türkiye generate electricity with an installed power of 1,272,62 MW. With this figure, Türkiye has become the fastest growing country in electricity generation from geothermal energy. Türkiye is the 4th country after the USA, Philippines and Indonesia in the world ranking of electricity generation from geothermal energy.

Because of its geographical location, Türkiye is the country with the 7th largest geothermal energy potential in the world. Therefore, Türkiye is one of the most fortunate countries in the world in terms of geothermal energy resources. Regarding the geographical distribution of Türkiye's prospective geothermal energy resources, 78 percent are in Western Anatolia, 9 percent in Central Anatolia, 7% in the Marmara Region, 5% in Eastern Anatolia, and 1% in other locations. 90% of geothermal resources in Türkiye are low and medium temperature, suitable for direct applications (heating, thermal tourism, various industrial applications, etc.). In comparison, 10% is suitable for indirect applications (electric power generation) (Koç & Şenel, 2013).

Below is a comparison of geothermal applications in Türkiye for 2002-2019, prepared by the General Directorate of Mineral Research and Exploration in Türkiye (MTA, 2020):

- While there were 16 appropriate fields for energy generation in 2002, it increased to 25 in 2018.
- While greenhouse heating was 500 decares in 2002, it climbed by 710 percent to 4052 decares in 2019.

- Housing heating grew by 316 percent, from 30,000 houses in 2002 to 125,000 houses in 2019.
- While installed power in electricity generation was 15 MW in 2002, it climbed by 8600 percent to 1304 MW in 2019.
- On the other hand, the country's apparent heat capacity increased by 1083 percent from 3000 MW in 2002 to 35.500 MW (including the private sector) in 2019.

### 1.5.5 Biomass

Biomass is defined as biological non-fossil organic matter that can be renewed in less than 100 years. In other terms, biomass refers to all non-fossilized biological components derived from live or recently living organisms. All organic substances of vegetable and animal origin, the main components of which are carbohydrate molecules, are considered biomass energy sources in this context. The energy obtained from these resources is called biomass energy (İlleez, 2020).

In 2018, 108 thousand 609 tons of biofuels were produced in Türkiye. This year, the biofuel sector, which produced 78 thousand tons in the first eight months, increased by 18 percent compared to the same period of the previous year.

**Table 3. Biomass Energy Supply of Türkiye**

| | BIOENERGY AND WASTE (TEP) | FIREWOOD (TEP) | WASTES (TEP) | BIOFUEL (TEP) | ANIMAL AND VEGETABLE WASTES (TEP) | LIQUID BIOFUELS (TEP) |
|---|---|---|---|---|---|---|
| 2000 | 6.457.000 | 5.081.000 | | | 1.376.000 | |
| 2005 | 5.325.000 | 4.146.000 | | | 1.179.000 | |
| 2010 | 4.489.000 | 3.392.000 | | 6.000 | 1.091.000 | |
| 2014 | 3.250.000 | 2.162.000 | | 81.000 | 1.007.000 | |
| 2015 | 2.945.000 | | | | | |
| 2016 | 2.843.000 | | | | | |
| 2017 | 2.531.000 | | | | | |
| 2018 | 3.014.000 | 972.000 | 1.883.000 | | | 159.000 |

**Source**: BP, Biomass Section, 2015.

In terms of biomass material production, Türkiye has a favorable sun, agricultural land, water resources, and climatic conditions, as well as a structure that may supply plentiful resources for biomass energy. Agriculture, woodland, organic city, and animal waste are among Türkiye's biomass resources. Conversion of biomass sources to energy is also very important because of its positive environmental effects. Türkiye's biomass waste potential is equivalent to 8.6 million tons of oil. Türkiye's usable bioenergy potential is approximately 17 MTOE (million tons of oil equivalent), and the energy production potential from wood and

forest residues is estimated to be approximately 7 MTOE. Forest residues have the potential to meet approximately 2 MTOE of Türkiye's energy production (T.C ETKB, 2021)

Türkiye's total installed power of biogas, biomass, waste heat and pyrolytic oil power plants have reached 554 MW. The electricity generated from this source was 467 MW in 2020 (T.C ETKB, 2021).

### 1.5.6 Hydrogen

Hydrogen is not primary energy like electrical energy but a secondary energy source and carrier. Hydrogen is not found pure in nature. It can be produced from renewable energy resources such as sun and wind or fossil resources such as natural gas and coal. Hydrogen is as clean energy as the primary energy source from which it is produced. In addition, hydrogen is an energy carrier that enables the storage of renewable energy resources (T.C ETKB, 2021)

The most important usage area of hydrogen fuel is the transportation sector. Hydrogen is used as fuel in space shuttles and rockets. Other areas considered are technological (such as mobile phones, computers, backup power units, etc.).

Türkiye is a country that closely follows hydrogen energy technologies and contributes to technology development. Various studies are carried out on hydrogen energy at the United Nations Industrial Development Organization-International Centre for Hydrogen Energy Technologies (UNIDO-ICHET) and TUBITAK in Türkiye. Therefore, thanks to UNIDO-ICHET, Türkiye is well-known among developing countries in terms of hydrogen energy technologies. In addition, Türkiye is represented very effectively in international forums such as the European Union and the International Energy Agency (IEA, 2021).

# 2. RUSSIA'S ENERGY POLICY

## 2.1. Overview of Energy in Russia

Energy resources are becoming increasingly important, and the world economy is in desperate need of them now more than ever. As a result, countries with abundant energy resources are in a strategic position in terms of economy and geopolitics (Kurban, 2022).

Russia is unquestionably unique among these nations, with the world's greatest deposits of fundamental energy resources. Russia, as the world's top energy state, has the potential to significantly impact global economic and geopolitical processes due to its geographical and strategic location, advanced industrial infrastructure, and educated workforce.

The global growth of energy issues, as well as their increasingly political nature, has made the energy factor one of the primary pillars of Russia's foreign policy. It has been observed, especially recently, that Russia directs its energy policies to achieve results in line with its interests in international relations and uses energy as a diplomacy tool. It is predicted that the importance of the energy factor in Russian foreign policy will increase even more considering the future course of world energy markets and Russia's position in these markets (Sailimu, 2014).

## 2.2. Russia's Energy Policy and Strategies

The Russian Federation, the country with the largest natural gas reserves in the world, has a quarter of its proven natural gas reserves. Russia exports nearly a third of its natural gas to countries in the Commonwealth of Independent States (CIS). 70 percent of exports outside the CIS are sent to Europe, especially Germany, Türkiye, and Italy. Russia has eight natural gas pipelines that are utilized to export natural gas. In the energy sector of the Russian Federation, oil pipelines are monopolized by Transneft and gas pipelines are monopolized by Gazprom. Gazprom also has a monopoly in the Russian Federation's natural gas production and aims to expand its oil production by acquiring Sibneft (Sailimu, 2014).

Gazprom, Russia's natural gas monopoly, controls 25% of the world's reserves and supplies 35% of the natural gas consumed in Eastern Europe. Exports to Europe account for two-thirds of Gazprom's revenue. As a result, Russia is essential to Europe's energy security.

Since its independence in 1991, the Russian Federation has maintained a foreign energy strategy that integrates its foreign policy and economic structure. With Vladimir Putin's election as President of Russia in 2000, the energy industry was upgraded to the highest priority economic sector, with the conclusion that it will surely contribute the most significantly to the country's reemergence as a superpower. In the context of this proof of the situation, "The Energy Strategy of the Russian Federation for 2020" was published in 2009 during the Putin presidency.

The Russian Federation's Energy Strategy for 2020, announced by the Russian Federation's government, defines the energy strategy of Russia and the overall framework of the energy diplomacy handled in this regard. To promote economic growth and quality of life, appropriate use of natural fuels and resources and the energy sector are at the forefront of this energy policy. Furthermore, the fundamental aim of the Russian energy strategy is to improve the quality of fuel and energy infrastructure, as well as to ensure global competition in production and services. The realization of the long-term energy policy of the Russian Federation is aimed at two stages. First stage: (Sevim, 2014)

- Establishing an integrated normative legal structure, removing obstacles to make transparent the competitive energy market based on fair trade principles,

- Completion of the transformation of adjacent sectors of the economy and placing them at the level of energy efficiency,
- Exporting oil and gas resources and giving access to domestic and international fuel and energy markets for energy firms. It is proposed to guarantee that fuel and energy corporations migrate from a passive to an active role in meeting the demands of the Russian economy and people for energy resources.

Second stage:

- Creating open and competitive energy markets within the framework of market infrastructure,
- Using the advantages of the nuclear and hydropower sectors, the coal industry, and petrochemical and gas chemistry to lay the groundwork for future projects,
- Increasing scientific, technical, and creative contributions to Russia's energy sector
- Giving priority to increasing the share of renewable resources in the upcoming process and the transition to "future energy."

In addition to the above-mentioned tasks, the goals of the state energy policy of the Russian Federation take priority. The strategic objectives of the long-term state energy policy include “energy security, the efficiency of energy in the economy, budget efficiency of the energy sector and environmental security of the energy sector”.

Russia is a member of the group of developed countries known as the "Group of Eight" (G8) and has to avoid policies that may harm the interests of these countries (France, Canada, Germany, Russia, Italy, Japan, the United Kingdom and the USA). Established during the global energy crisis in the 1970s, the International Energy Agency (IEA) protects the interests of developed Western countries and works to ensure long-term energy security (IEA, 2021).

On the other hand, 55% of the foreign trade revenues of Russia, which is a net exporter of energy resources, come from the share of oil and other energy resources. Therefore, since the high price level in the world energy markets increases export revenues in the long run, it is in line with the interests of Russia and other exporting countries. While most of these countries are united under the Organization of Petroleum Exporting Countries (OPEC), some countries, such as Russia, are independent exporters. Considering the fact that the interests of the developed countries, which are net importers of energy resources, and the countries that export these resources do not match, Russia tries to maintain a balance between the IEA and OPEC and shapes its foreign economic policies in this direction.

Finally, Vladimir Putin, who has a doctoral thesis on using natural resources and how to benefit from these resources while forming the country's foreign energy policy, has undoubtedly been influential in the official "foreign energy policy" software. In this context, Russia is the only country with an official "foreign energy policy". The policy in question is explained in the Energy Strategy Document of Russia as follows: (Sevim, Rus Dış Enerji Politikası ve Yeni Hedef Kuzey Doğu Asya, 2022) *"The strategic aim of the foreign energy policy is to use Russia's energy potential to the maximum extent to integrate into the world markets fully, to increase positions on it and to gain the highest possible profit for the national economy."*

### 2.3. Energy Resources of Russia

In terms of energy resources, Russia is one of the world's richest countries. Russia has the world's largest natural gas reserves, second largest coal reserves, and ninth largest oil reserves. Russia now has 14.1 billion tons of confirmed oil reserves (103.2 billion barrels). Natural gas reserves in Russia are in better shape than oil reserves. Russia has 47.5 trillion cubic meters of gas accessible, according to government figures. Simultaneously, Russia, as it is known, has the greatest coal reserves and is one of the countries that actively uses nuclear energy. In addition, Russia's lands contain 32% of the world's proven natural gas reserves (23% of probable reserves), 12% of proven oil reserves, 10% of discovered coal reserves (14% of estimated reserves), and 8% of proven uranium reserves. Russia is the world's largest natural gas exporter, as well as the world's second largest oil exporter and third largest energy consumer.

#### 2.3.1. Coal Reserves

Russia is the leader in the world, with its geological coal reserves of 375 billion tons. More than 250 billion tons of its reserves are economically discoverable coal reserves, while 140 billion tons are lignite. With 36,173 billion tons, Russia has the world's second-largest discoverable coal reserves after the USA.

Russia's coal reserves are spread over a wide area. The main anthracite reserves are in the Pechora and Kuznetsk regions; lignite reserves are located in the Kansk-Achinsk region. The Lena and Tunguska fields of Siberia have unexplored resources.

Russia's coal production in 2020 decreased by 9.3% to 398 million tons, as low foreign prices encouraged miners to limit production. According to official data, it was 3.2 million tons lower than the provisional data. According to the data, 82% of the total production, i.e., 325 million tons, was hard coal. Despite the decrease in production, Russia's coal exports increased by 1.6% to 192.8 million tons in 2019. In summary, while Russia's production decreased in 2020, its exports increased.

However, Russia's coal production in January 2021 increased by 3.9% annually to 1.11 million tons/day (34.3 million tons) due to the increase in demand and the acceleration of production due to the limited supply of competitors. According to official data, the increase in coal production was 1.2% higher than the provisional data announced. It has been reported that 80% of the total production of 34.4 million tons consists of hard coal (Lawson, 1994).

### 2.3.2. Oil Reserves

Russia has 14.1 billion tons of proven oil reserves (103.2 billion barrels). This is equivalent to 6.1 percent of the world's oil reserves. Russia ranked eighth in the world in 2020, with 80,000,000 barrels of oil reserves, accounting for approximately 4.8% of the world's total oil reserves of 1,650,585,140,000 barrels. Russia produced an average of 10 million 973 thousand barrels of oil per day in May 2017, totaling 46.5 million tons. As a result, it remained the world's largest oil producer, surpassing the United States, which produces 10 million 442 thousand barrels per day, and Saudi Arabia, which produces 10 million 15 thousand barrels per day (The Analysis of Russian Oil and Gas Reserves, 2021).

Russia's crude oil output reached historic highs in 2018 as a result of growing global demand. The majority of Russia's crude oil is exported to Europe and China. Since 2016, around 60% of Russia's crude oil exports have gone to Organization

for Economic Cooperation and Development countries (OECD). Russia is also a key exporter of crude oil to China and its neighbors (Beral, 2007).

According to the Russian Ministry of Energy in 2019, it was stated that Moscow reached the highest level of oil production after the Soviet Union period. Reaching 11 million 160 thousand barrels per day in 2018, the production capacity of Russia exceeds its annual average. The production level exceeded the average of 10 million 980 thousand barrels per day recorded in 2017. Russia's oil production reached 555 million 838 thousand tons in 2018 compared to 547 million tons in 2017.

The Organization of the Petroleum Exporting Countries (OPEC) and many other oil-producing countries, especially Russia, agreed to reduce the total crude oil production by 1 million 200 thousand barrels per day as of January 2021 in order to reduce oil prices at the meeting held in December 2020. (Temizer, 2022)

Oil prices, which were affected by several factors, such as increased supply capacity, especially in the USA, and which lost more than 20 percent in value in 2018, recorded the lowest level of recent history in the 2021 due to the Covid-19 pandemic.

Russia do not have good relations with OPEC countries. However, after the meeting held by the OPEC in Vienna on June 23 of 2016, Russia would accept the agreement between the OPEC led by Saudi Arabia and some countries outside this organization, and within this framework aims to reduce oil production by 1.6 million barrels (BP, Renewable Energy Section, 2019)

On the other hand, it has been proven that Russia’s reserves are equivalent to 60.4 times its annual consumption. Therefore, without Net Exports, it means that Russia has approximately 60 years of oil reserves left to be self-sufficient (Beral, 2007).

#### 2.3.2.1. Oil Pipelines in Russia

Russia's oil pipelines connect remote areas with central pipelines that carry oil to the refinery or terminal for export. Crude oil is exported through Russia's

public pipeline monopoly, Transneft. Except for the Caspian Pipeline Consortium, all oil pipelines are owned by the public company Transneft and operated by the petroleum products subsidiary Transnefteproduct.

Russia has three major export pipelines: the northern Druzhba, the southern Druzhba, and the Adria. The Druzhba pipelines link the Volga-Ural area to Ukraine to the south and Germany to the north. The Adria pipeline was built in 1979, but it has been in need of maintenance since the 1990s. The Druzhba pipeline transports 1.3 million barrels of oil per day. A total of 350,000 barrels per day are sent south to Hungary, the Czech Republic, and Slovakia. It is also the world's longest oil pipeline and one of the world's largest oil pipeline networks. The Druzhba pipeline system spans 2,910 kilometers through Belarus. The pipeline runs 1,490 kilometers across Ukraine, 670 kilometers through Poland, 130 kilometers through Hungary, 332 kilometers through Lithuania, 420 kilometers through Latvia, and around 400 kilometers through Slovakia and the Czech Republic. The pipeline runs beside 45 major rivers and 200 trains and highways. Oil is transported across 4,000 kilometers from eastern European Russia to Ukraine, Belarus, Poland, Hungary, Slovakia, the Czech Republic, and Germany. To carry its products to Eastern Europe and beyond, the network is likewise divided into various pipelines. The name "Druzhba" means "friendship," meaning that the pipeline transports oil to the Soviet Union's energy-hungry western regions, its "fraternal socialist allies" in the former Soviet bloc, and Western Europe. Today, it is the primary route for Russian (and Kazakh) oil throughout Europe (Filip & Bretislav, 2014).

Baltic Pipeline System (BPS):

The Baltic pipeline system began carrying crude oil from Russia's West Siberia and Tömen-Pechora oil fields westward to the newly completed Primorsk port in Russia's Gulf of Finland in December 2001. The capacity of Primorsk has continually increased, reaching 1.5 million barrels per day in 2007. The Baltic pipeline system has provided Russia with a direct route to Northern European markets, reducing the country's dependency on transit routes through Estonia, Latvia, and Lithuania. The cost to the Baltic countries of transporting Russian crude oil from the BPS passing through the Baltic region has been significant. Export capacity in Primorsk is regularly increasing, reaching an average of 1.5 million

barrels/day in 2007. Exports from the port will continue to increase this year using large-scale Baltimax tankers. However, the actual export capacity of the port is around 3 million barrels/day, and the pipeline capacity coming to the port limits exports.

The BPS-II expansion will create new export points to the region. In May 2008, the Russian government decided to operate a new line to the port of Ust-Luga with a branch extending to the Kirishi oil refinery. The first phase of BPS, designed to transport oil from Russia's oil-producing regions and Kazakhstan, was put into service in 2001. Transneft estimates that the second stage to Ust-Luga port will cost approximately $3.3 billion (Beral, 2007)

Transnefteproduct, Russia's product line operator, started exporting products from the port of Primorsk in May 2008. As of the third quarter of 2007, approximately 180,000 barrels/day (8.4 billion tons/year) of products have been exported (Energy Information Administration, 2007).

Kharyaga-Indiga Pipeline:

There are two advantages of transporting internationally from the Murmansk oil field. Firstly, the port is not icy for most of the year. Secondly, its depth is sufficient to make transportation to the USA economical without reloading in Europe. Transneft has been indifferent to many pipeline proposals connecting the Murmansk area to the existing production areas in the south in the last few years. The public company is planning a 240-mile pipeline from the nearby Tömen-Pechora production basin, covered with ice in winter, to Indiga. A timetable for production has not yet been determined. The Tömen-Pechora oil has a lower sulfur content and is lighter than the rest of the Urals oil (Beral, 2007)

Today, Russian oil is brought to Murmansk by rail, and in 2007 about 270,000 barrels/day of crude oil and products were exported from this point. Lukoil completed in June 2008 the terminal with a capacity of 240,000 bbl/day in Varandel, which was worth $1 billion, allowing transportation from the northern part of Tömen-Pechora. Lukoil's main source for this terminal has been the Yuzhno-

Khyichuyu field, where production will begin (Energy Information Administration, 2014).

Eastern Siberia Pacific Ocean Pipeline- ESPO:

Until 2004, Russia's energy officials were opposed to the construction of one of the two pipelines that would transport oil to East Asia. Putin announced that Russia will construct a 2,500-mile pipeline in two stages from the Russian city of Taishet to the Kozmino Bay southeast of Nakhodka. To safeguard endangered animals, the pipeline's endpoint was relocated from Perevoznaya Bay. The first phase of the 600,000 barrels per day pipeline runs 1,200 miles from Taishet to Skovorodina, with a port in the Gulf of Kozmino. On January 1, 2011, the pipeline went into service and pumped 42 thousand tons of crude oil in two days. The pipeline would deliver 15 million tons of crude oil to China each year until 2030, according to an agreement negotiated between Moscow and Beijing (Energy Information Administration, 2014).

### 2.3.3. Natural Gas Reserves

With 75.6 trillion cubic meters, the largest natural gas reserves in the world are in the Middle East. It is followed by the Commonwealth of Independent States, including Russia and Turkmenistan, which have reserves of 64.2 trillion cubic meters. Therefore, the Russian Federation, with the world's largest energy reserves, is a country that has the first position in global natural gas exports. As a result of Russia's nature as the most important natural gas exporter, it is a very important strategic power in the world energy market, especially in the EU and the developed countries of the Asia-Pacific Region (Bayraç, 2009, s. 127). Russia’s proven natural gas reserves are 47.80 trillion cubic meters producing 737 billion cubic meters of natural gas annually.

Russia produces gas in Western Siberia (Yamalo-Nenets, Khanti-Mansiisk, Tomsk), Eastern Siberia and Russian Far East (Sakhalin, Irkutsk, Krasnoyarsk, Yakutsk), Ural-Volga (Orenburg, Astrakhan), Komi Republic and the North Caucasus regions. Russia, one of the world's largest natural gas producers, obtains

more than 80% of its total natural gas production from the Yamalo-Nenets region in Western Siberia.

Russia's natural gas output climbed by 7% in 2018, exceeding the growth in exports. The Yamal LNG export facility, which received its maiden cargo in December 2017, has the capacity to liquefy more than 16 million tons of natural gas per year. It is responsible for almost all of Russia's recent rise in LNG shipments. Since 2000, more than 80% of Russia's natural gas exports have gone to Europe.

Energy security for Russia is achieved by maintaining the monopoly dominance in the natural gas production and distribution sectors and by carrying out intense statist policies through Gazprom. Russia is increasing the pressure on them through bilateral agreements with Azerbaijan, Turkmenistan, Uzbekistan and Kazakhstan, which may be rivals in the future. On the other hand, it also takes control of the infrastructure and transportation systems of countries such as Georgia, Moldova, Lithuania, Ukraine, Belarus, and Bulgaria in return for the price of the exported natural gas and various advantages determined by the agreement (Karahasanoğlu, 2012).

#### 2.3.3.1. Natural Gas Pipelines in Russia

Russia operates six pipelines: the Yamal-Europe Pipeline, the Nord Stream Pipeline, the South Stream Pipeline, the Brotherhood Pipeline, the Blue Stream Pipeline and the Northern Lights Pipeline. Most of the natural gas is transported to Europe via Ukraine. Some of these projects will be explained in more detail in Chapter 3.

Yamal-Europe I Natural Gas Pipeline:

The first Yamal-Europe natural gas pipeline connects the natural gas fields in the Yamal peninsula to Poland and Germany via Belarus, and its capacity is approximately 1 Tcf/year. With this project, the capacity will be increased by 1 Tcf. The second leg of the route across Poland has yet to be agreed upon by Gazprom and Poland. While Gazprom seeks a route from southeastern Poland to Slovakia

and Central Europe, Poland prefers that the pipeline passes through its territory before entering Germany. This new export corridor has increased the flexibility and reliability of Russian gas supply to Western Europe. The Yamal – Europe pipeline is a project with investment priority implemented as part of the Trans-European network (Gazprom, 2020). With the commissioning of the last compressor station in 2006, it reached a capacity of 32.9 m³. The total length of the line is more than two thousand kilometers (Gazprom, 2020). The pipeline in question has made the Republic of Belarus a key transit country in transporting Russian natural gas to Europe (Mayorov, 2009: 31). Geopolitical problems between Ukraine and Russia increased the importance of the Yamal-Europe pipeline. The construction of a new pipeline (Yamal - Europe - II) on the same route came to the fore.

Nord Stream I-II Natural Gas Pipeline

The Nord Stream project, which was included in the Trans-European network with the decision adopted by the EU Commission in December 2000 and approved in 2006, is another important natural gas project passing through the Baltic Sea. Gazprom is one of the main shareholders, with a 51% share in the project. The twin pipeline reaches Greifswald, Germany, from the Vyborg region of Russia via the Baltic Sea. The Nord Stream project encompasses Russia's special economic zones, Finland's, Sweden's, Denmark's, and Germany's territorial seas, as well as Russia's, Denmark's, and Germany's territorial waters (Gazprom, 2020). With its offshore pipeline characteristic, Nord Stream is a directly linked pipeline between Russia and the EU energy market. It has a natural gas export potential of 55 billion m3 to EU markets for at least the next 50 years. According to the European Parliament and Council, the initiative serves "European interests" in terms of supply security (Gazprom, 2020).

The entry point of the 'North Stream - 2' pipeline starts from the Ust-Luga region of Russia and then passes through the bottom of the Baltic Sea and reaches Greifswald, Germany, the destination of the 'North Stream-1' project. Successful experiences operating the 'North Stream -1' project have significantly influenced the decisions to build the 'North Stream -2' pipeline. With the new pipeline project led by Gazprom, Russia plans to continue directly reaching the European market. The annual total export capacity of the twin projects is 110 billion m³ (Gazprom,

2020). In April 2017, Engie (France), OMV (Austria), Royal Dutch Shell (Netherlands/England), Uniper and Wintershall (Germany), which are European energy companies, signed an agreement to finance the pipeline. With the agreement, these five companies are financing 50% of the total cost of the project on a long-term basis (Gazprom, 2020). The total cost of the project is 9.5 billion dollars. With the announcement of the 'North Stream-2' project in 2015, the assessment agency Fitch predicted that constructing a new pipeline would pose risks due to the increase in Gazprom's debt burden and reduce demand in Europe. However, the participation of major European energy companies, which invested a significant amount in the pipeline construction, ensures the project's credibility in terms of financial stability. At the beginning of 2018, the construction of the project's Russian and German terrestrial parts started. On September 5, 2018, the laying of the pipeline's offshore section under the Gulf of Finland began in the exclusive economic zone of Finland. On September 25, the construction process on the German coast gained momentum, and a significant part of the project was realized in technical terms, but it is not yet operational (Hamzaoğlu, 2021).

When examined over European politics, the Nord Stream 2 natural gas pipeline project, which is planned to increase the supply of Russian gas to Europe, especially to Germany, has turned into the "geoeconomic war" in Europe between Russia and the United States of America. In the natural gas war, where the USA and Russia share their trump cards over the European market, it is noteworthy that Germany and the European Union (EU) could not take a step and remain in the middle. The US opposes the Nord Stream 2 pipeline's completion to increase liquefied natural gas (LNG) exports, gain a bargaining edge in trade disputes in international markets, and prevent the EU and Russia from getting closer. On the other hand, market analysts emphasize that American LNG is expensive compared to Russian gas and state that the US's political intervention in Europe's energy policies will be to the detriment of the continent. On the other hand, while the companies involved in the project are accelerating their steps to complete the project, Ukraine, Poland, the Baltic countries, and the USA oppose the project due to the concern of "too much dependence on Russian gas".

Brotherhood Natural Gas Pipeline:

The first route used by Brotherhood Russia is the Brotherhood pipeline, which carries natural gas resources in Western Siberia and has an annual capacity of 30 billion m3. The 2,750 km line, the construction of which was completed in 1967, constitutes approximately 70% of the gas transported by Russia to Western Europe (Beral, 2007).

Nord Stream Pipeline (Northern Europe Pipeline):

The Northern pipeline, which runs 2,000 miles from Russia to Finland and England over the Baltic Sea, was proposed by Russia and Britain in June 2003. It was renamed Nordstream by shareholders in 2006. About 700 miles of the pipeline will pass under the Baltic Sea, while 570 miles will pass over the Russian mainland. The most important feature of this road is that there is no transit country. Therefore, transportation costs and risks will be low. Theoretically, this pipeline will be a reliable pipeline providing natural gas to Western Europe. In November 2006, Gazprom (51% stake) and Germany's BASF and E.ON (24.5% stake each) provided information on the project on environmental impact assessment to the Baltic Sea coast countries. The project cost is approximately US$ 5.7 billion, and the capacity will be 0.9-1 Tcf. With the project, Russia will eliminate the necessity of negotiating transit fees with about 12 countries (Gazprom, 2020).

## 2.4. Renewable Energy Resources of Russia

### 2.4.1. Geothermal

Russia has large reserves of organic fuels and geothermal resources, with more than 12 times the energy of total organic fuel.

Significant geothermal resources are found in the region near Chukotka, the Kuril Islands, the Sea Coast, Western Siberia, the North Caucasus and Lake Baikal. Low-potential heat-based heat pumps can be used in two-thirds of the Russian region. Russia's geothermal energy potential exceeds fossil fuel resources by 10-15 times and represents the temperature range of 30-200°C. More than 4,000 wells

with a depth of 5 km have been drilled for low potential temperature local use. For this reason, geothermal energy can be used effectively for heating cities and settlements that make up 75-80% of Russia's land (Svalova, 2012).

More than 3,000 wells worth more than $4 billion have been drilled to exploit geothermal resources in Russia. 365 wells with depths varying between 200 and 2,500 meters were drilled in the Kamchatka geothermal field. According to the Volcanology Institute, the discovered geothermal resources are sufficient to supply Kamchatka's electricity and heat needs for more than 100 years. Kamchatka is one of the hottest spots in Russia. Therefore, the geothermal resources of Kamchatka exceed 5,000 MW. The Mutnovskoe field, located in the south of Kamchatka, has a capacity of 300 MW. There are also rich geothermal resources in Koshelevskoe, Bolshe Bannoe and Kireunskoe. All of these areas can generate approximately 2,000 MW of energy. There are important geothermal resources in Chukotka, which also borders Kamchatka. Some of it has yet to be discovered, but it is used effectively to supply energy to nearby settlements. (Altuntaşoğlu, 2003)

The Kuril Islands, like Kamchatka, are another of Russia's hottest spots. The Kuril Islands also have rich geothermal resources. According to estimates, these islands have sufficient resources for electricity and thermal energy provision to the region for 100-200 years. The island of Iturup is newly discovered and has 30 MW to meet the energy needs of the entire island. The southern island of Kunashir has geothermal energy resources used for electricity and heating of Yzhno-Kurilsk. Although no research has been done on the Paramushir mountain in the north, it is known to have a good 70-95 °C geothermal water (Svalova, 2012).

### 2.4.2. Wind

Wind energy potential varies over Russia. The wind atlas of Russia shows that there are many areas where the average annual wind speed exceeds 6 meters per second. The highest average wind speeds are found on the Barents coast, the Black Sea, the Bering Sea, and the Sea of Okhotsk.

The East Siberian coast, the Chukchi and Laptev seas in the north, and the Eastern Sea of Japan are other areas with reasonably strong wind speeds (5-6 m/s).

Wind speeds are slightly lower on the Black Sea, Azov Sea, and Caspian Sea coasts in the south and the White Sea coast in the northwest (3.5-5 m/s). Important springs are also found in the low and middle Volga Regions, the Urals, the steppes of Western Siberia and around Lake Baikal. Therefore, wind farms operate mostly in Russia's Central and North-Western Federal Districts and less intensively in the Ural and Volga Federal Districts. In most of Russia, the wind speed is higher during the day than at night. However, the difference between day and night in winter is very small. The annual variation in average wind speed is negligible in most of Russia

In the Russian wind energy business, there are around 50 major players, although about half of them produce turbines. Almost every one of them has its unique design. Foreign technology transfer accounts for less than 1% of all wind turbines produced (Şahin & Nuriyev, 2021).

Some legal documents prepared to promote renewable energy have emerged since 2008. The most important of these is the distribution of WPP electricity generation share rate by years, prepared by the Russian Federation Government on April 8, 2010. The share of RES was 1.5% in 2010, 2.5% in 2015, and 4.5% in 2020 (Sergey A. Burtsev, 2020).

### 2.4.3. Solar

Russia is positioned between 41 and 82 degrees north latitude, and the amount of solar energy received varies greatly across the country. According to the estimates, the annual average solar radiation in the far northern regions is 810 kWh/m2, whereas more than 1,400 kWh/m2 per year in the southern parts. Solar radiation levels also show large seasonal variations.

The North Caucasus, the Far East and Southern Siberia are the most isolated regions of Russia. The average annual solar radiation current in these regions is 4-5 kWh per square meter, comparable to Southern Germany and Northern Spain, which are among the leading countries in applying photovoltaic systems (PVS) (Bayar, 2008).

### 2.4.4. Hydraulic

Electricity generated using hydropower is the most advanced sustainable energy source in Russia. Russia has an estimated annual gross hydropower potential of 2.395 billion kWh, corresponding to 80% of the medium and large rivers' technical potential (1,670 billion kWh/year). The country's economic potential is 852 billion kWh/year, and only about 23% is used. It is estimated that 1.670 billion kWh is used, corresponding to about 60% of its total capacity. Hydropower supplies approximately 21% of Russia's electricity production. Small rivers supply 46% of the total hydro energy potential (Bayar, 2008).

According to the World Commission, Russia's hydroelectric potential on dams is 29,000 billion kWh/year, with major and medium-sized rivers accounting for 83 percent of this. Economic potential is projected to be 35 percent of gross potential, or 1.015 kWh/year, considering economic development, economic efficiency, environmental aspects and other aspects.

The majority of potential hydro energy resources are found in Central and Eastern Siberia, as well as the Far East. The North Caucasus and the western Urals have good hydropower potential as well. The Far East and Eastern Siberia together account for more than 80% of the hydro energy potential and can generate between 450 and 600 billion kWh per year (Bayar, 2008).

### 2.4.5. Biomass

Russia has great potential for large-scale and effective use of biomass resources. Russia annually produces 14-15 billion tons of biomass as a result of processing 21-22.5 billion tons of carbon dioxide (CO2).

Different parts of Russia's national economy produce 300 million tons of solid waste, of which 230 million tons come from agriculture and 70 million tons from cities. The energy potential of this amount of waste is 190 MTCE, of which 45 MTCE can be produced annually. By processing the mentioned wastes using biogas technologies, up to 80 bcm of biogas can be produced, corresponding to 56 bcm of natural gas (Bayar, 2008).

# 3. TÜRKİYE AND RUSSIA RELATIONS

## 3.1 Overview of Türkiye-Russia Relations

Türkiye-Russia relations span over five hundred years. Bilateral relations followed a fluctuating course throughout these years. The Cold War period and the bipolar international system have been important factors in shaping Turkish-Russian relations, threat perceptions and attitudes towards each other. In addition to these, there have been some processes leading to partnerships between the two countries from time to time. In some periods, as in the case of the Cold War, Turkish-Russian relations were limited in terms of partnership. However, with the transformation of the international system in the 1990s, which corresponded to the collapse of the Soviet Union, Turkish-Russian relations have changed to a large extent. The ever-increasing economic relations and the fact that Turks and Russians redefine each other both in the international system and at the regional level paved the way for strengthening the political relationship between them. While the Soviet Union saw Türkiye as an inseparable ally of the West during the Cold War, Türkiye perceived the Soviet Union as a major external threat. Still, this perception did not cause the isolation of the two socially based nations from each other and bilateral relations continued at a controlled level. In this apparent context, it has exhibited a rapid change and transformation in economic and political terms after the Cold War (Şahin & Nuriyev, 2021).

The 1990s saw a shift in ties between Türkiye and Russia. In the first half of the 1990s, the emphasis on 'competition' was determined by the bad legacy of the two nations' history, while in the second half, the emphasis on 'partnership' was shaped by new ambitions. The purpose of expanding economic and commercial connections during these years was to bring a new dimension to Turkish-Russian relations.

Following the fall of the Soviet Union in the 1990s, Türkiye-Russia relations may be divided into numerous categories. These are Russia's non-compliance with the provisions of the European Conventional Forces Reduction Agreement (CFE) in the Caucasus region, Türkiye and Russia following different policies on issues such as Chechen, Abkhazia and Nagorno-Karabakh, Russia's approach towards the PKK (Kurdistan Workers Party) terrorist organization is disappointing the Türkiye, the armament problem in Cyprus and the S-300s, and the dominance of the Turkish navy in the Black Sea. In addition to these, issues such as the Straits and the establishment of alternative energy transmission pipelines are also issues that pose potential problems in bilateral relations. The relationships between the two countries were far from being a strategic partnership and included different strategies, especially at the beginning of the 1990s. In close regions such as the Caucasus, the Balkans and Central Asia, Türkiye and Russia had different positions. There were regions where a common denominator was created with such a distance, and political behaviors that could be considered common in international relations were exhibited. The most basic example of this is the Black Sea Region. The Republic of Türkiye and the Russian Federation did not want a third power to enter the Black Sea since the early 1990s. In particular, efforts were made to prevent the United States from dominating this region, and they opposed the expansion of NATO to the Black Sea (Oktav, 2022).

Since the 1990s, the relations between Türkiye and Russia have been close with a level of caution. However, several contradictions have been faced in the relations during this period. While there is competition between Türkiye and Russia in the Eurasia region, economic relations are rapidly improving. This situation can be interpreted as both states considering partnership and competition to get along.

The two countries continued to develop their political and economic relations, especially in the second half of the 1990s. The existing dialogue in bilateral relations developed further. Many important points came to the fore in the 2000s. With the effect of globalization since the beginning of the 2000s, a crisis experienced in one part of the world can affect many states or regions. The natural gas crisis between Russia and Ukraine is one of the best examples. Due to Ukraine's accumulated debts, the Russian state company Gazprom has imposed an embargo on gas purchases. Thus, the crisis between the two states affected many European Union countries and Türkiye directly or indirectly. In other words, globalization has increased its power based on the geographical spread of the effects of the crises. Russia and Türkiye have learned important lessons in these years and tried to establish mutual trust by putting an end to the perceptions of the threat of the past and not bringing up the problems of the past (Kurban, 2022).

The changes in power in both countries at the beginning of the 2000s contributed to the development of Turkish-Russian relations. With the coming to power of Vladimir Putin in Russia and the Justice and Development Party (AK Party) in Türkiye, bilateral relations benefited from these changes. However, the relations between Türkiye and Russia change in parallel with the developments in the world. This change plays an important role in reshaping the mutual perceptions of the two countries. From the early 2000s, there has been a change and transformation in the relations between Türkiye and Russia, at least in discourse, if not in action (Kurban, 2022). The most important factors underlying this change and transformation are internal factors and developments in the international system. However, according to some experts, the reason for the rapprochement between Türkiye and Russia is that both countries were uncomfortable with the policies of the USA. As a result of the

developments in Iraq in 2003, the American army's desire to enter Iraq through Türkiye and its rejection by the Turkish Grand National Assembly, Russia and Türkiye adopting a similar attitude towards the USA's Black Sea policy, and the West's rejection of Türkiye and Russia by the West in many political and economic matters. Türkiye and Russia got closer in this period and concentrated on further improving bilateral relations. In summary, in addition to the developments in the international system, the changes in the national actors at the national level were some of the most important factors in both countries' foreign policies (Kılıçkan, 2021).

Since 2010, several crises or regional events have greatly influenced the relations between Türkiye and Russia. First of all, the spread of the popular movements that started in the Middle East to Syria forced the two countries to develop their relations further in this region. After the start of the popular movements in Syria, Türkiye's attitude as a neighboring country was important to ensure stability in the country and the region. Türkiye has adopted a 'wait-see' policy as a stance against the events in Syria. With an influx of refugees to Türkiye due to the crisis in Syria, Türkiye would suffer economic losses and strategic consequences related to the Kurdish issue. Russia, on the other hand, differs in its approach to the Syrian crisis. Syria continued to be seen as a traditional ideological ally in Russia, where the traditional perception of the Soviet Union is still alive (Dilek, 2017). The Syrian crisis was the most important test of the 2010s to measure the relations between Türkiye and Russia. During the crisis, Russia and Türkiye supported different blocs with disguised rivalries. However, despite this competition, Türkiye and Russia maintained their high-level partnerships (Kılıçkan, 2021).

The downing of the Russian plane by Turkish jets on November 24, 2015, was accepted as a sign that the bilateral relations between Türkiye and Russia would always

be threatened by geopolitical competition. For Türkiye and Russia to benefit from the areas of geopolitical competition, establishing partnerships is the key to managing this competition together. Moreover, the fact that relations between Russia and Türkiye came to a breaking point after the aircraft crisis showed a similarity in Syria. Russia, which strengthened its hand in Syria after the plane crisis, controlled a large part of the airspace. This was one of the biggest obstacles in front of Türkiye's possible intervention options. The tension in Turkish-Russian relations started in November 2015 and was tense until the letter Erdoğan wrote in June 2016. President Putin called President Erdoğan and expressed his condolences for the tragic attack carried out by DAESH at the Atatürk Airport in June 2016. Then, the coup attempt on 15 July 2016 continued to bring the two countries closer to each other. However, with the assassination of Russian Ambassador Andrey Karlov on December 19, the impression that the long-standing negative atmosphere in Turkish-Russian relations could be revived and those waiting for the two countries to come to a showdown was in vain. The leaders of both countries interpreted that the incident was an assassination and that this action was sabotage organized to undermine the improving bilateral relations between Türkiye and Russia (Yesevi, 2018).

Another topic that closely concerns Türkiye in recent times is the war between Russia and Ukraine. It is a military activity that started with the annexation of Crimea in 2014 after the President of Ukraine Viktor Yanukovych asked Russia to send troops to the region due to the tension in Crimea. This annexation should not be confused with the crisis in Ukraine, which coincided with a period when the popular movements in the Middle East continued. However, in order to provide unity among the subjects, the Ukraine crisis can be briefly mentioned. The crisis in Ukraine has created a new problematic area between Türkiye and Russia. As a country that cares about stability

in the Black Sea, Türkiye has found it appropriate to follow a 'middle way policy' in the Ukraine Crisis. For this reason, Türkiye has defended the territorial integrity of Ukraine by opposing the annexation of Crimea and maintaining its bilateral relations with Russia without harming it (Oktav, 2022).

Russia exports most of its natural gas through Ukraine. After the crisis with Ukraine, with the TurkStream project, Ukraine reduced the need for this route. On the other hand, Ukraine will be able to continue its export to Türkiye and the European market by creating a new transit route. The TurkStream project makes it possible to rapidly increase the mutual dependence in bilateral relations. Thus, the relations between Türkiye and Russia will benefit from a healthier and more solid ground. Given the rapid progress in relations between the two countries, it will be possible for both states to take action against the problems that may arise in their bilateral relations in a way that will not harm their cooperation (Kurban, 2022).

On February 24, 2022, the war between Russia and Ukraine entered a new phase in which Türkiye-Russia relations were tested again. Since the onset of the war, Türkiye has been the only NATO member country whose airspace has been open to Russia, stating clearly that it would not participate in the sanctions against Moscow. Türkiye sustained its diplomatic relations with Russia despite all conditions. Ankara has kept diplomatic channels open with Ukraine and Russia. Hosting the representatives of both countries, first in Antalya and then in Istanbul, drew the whole world's attention to Türkiye, and there was an expectation of progress in these negotiations. In addition, another reason for drawing the world's attention to Türkiye was whether Türkiye would send the S-400 medium-range air and missile defense system, which it had purchased from Russia to Ukraine, and in what direction its relations with Russia would progress (Şahin & Nuriyev, 2021).

In the light of all these developments, the question of how long the balance policy can be sustained in its relations with Russia also comes to the fore in the Russia-Ukraine crisis, where Türkiye has had the opportunity to improve its relations with Israel and Greece, with both of which it has had problems recently. The question 'Does Türkiye's efforts to reduce tension in its relations with the USA and the EU distance itself from Russia?' is also discussed, especially in the Western press. It is not possible to give a definite answer to these questions. However, at this stage, one can say that Türkiye and Russia would definitely not want to adopt any strategies that would put the relations at risk in the current conjuncture. Therefore, Russia acts as a lever for Türkiye and Türkiye for Russia against the West. In addition, both countries would not want to endanger their intertwined relations based on energy, tourism and trade (Kurban, 2022).

Türkiye's attitude in the war between Ukraine and Russia has come to the fore with its remarkable diplomatic success. In addition, Türkiye came to the fore in the Russia-Ukraine War because Türkiye described Russia's attack on Ukraine as war and closed the Straits to the warships of the countries that were party to the war in line with the Montreux Straits Convention. Ankara stated that this decision was not taken at the request of Ukraine and that the situation in question was defined as war by experts. Therefore, although the Russia-Ukraine War contains many crises and opportunities in terms of Türkiye's relations with Russia and the western world, it has proven that Türkiye's respected place and geostrategic importance in the international system and the international community are undeniable (Karahasanoğlu, 2012).

### 3.2. The Role of Energy in Türkiye-Russia Relations

Common interest and common threat are two important elements that improve relations between states. States shape their foreign affairs based on these two facts and make appropriate political or economic breakthroughs. In particular, a country's geopolitical position, the region's power and resources, population growth, and ethnic differences cover the areas of common interest and common threat. In this context, the issue that carries the highest tension and cost in the parameters formed is energy. Cooperation on energy, production and supply affects and shapes countries' relations. If a country's energy policy is consumption-oriented and far from production, the energy partnerships sought in foreign relations are with the states that are suitable in terms of reliability and price arrangement. In this context, producer countries try to establish close ties with countries searching for energy suppliers suitable for their own interests. Countries that want a monopoly and become an indispensable option in the energy market by choosing certain regions establish energy business partnerships with countries in the chosen regions that are suitable for their portfolio (Yeşilot, 2021).

After making a brief introduction to the place of energy in international relations in this section, the role of energy in Türkiye-Russia relations will be explained.

Recently, Türkiye's population growth has increased, causing an increase in energy consumption. Moreover, the development and recovery in different sectors in Türkiye have also increased energy consumption. On the other hand, demand cannot be met fully due to insufficient underground reserves and energy production. Home to the world's largest reserves and power generation plants, Russia is looking for a consumer country. For these reasons, energy partnerships between Türkiye and Russia have been following an upward trend, with Russia increasing its daily production capacity to meet Türkiye’s increasing energy needs (Kılıçkan, 2021).

A country's industrial production structure shapes its energy policies and the international economic environment, depending on the markets for goods, services, and, most importantly, energy. The energy consumption or use shaped by the

country's industrialization level indicates the production structure. It offers the opportunity to show a dimension of the economic growth limits (Türe, 2019).

Countries determine their energy policies based on the possibilities of continuity in acquiring energy resources, new resource supply, resource diversity, security of energy supply, national security, economic and human capital and employment conditions.

Energy plans are based on energy policies. These plans help determine the primary and secondary energy based on resources that require economic and social development strategies to realize. The main requirements are to minimize the environmental time by increasing the efficiency of domestic resources, to provide financing for energy production, and to ensure that the production and development plans of the sub-sectors that produce energy are in harmony with the national energy strategy. It is also important to determine national policy decisions affecting supply and demand (İpekoğlu, 1996).

Energy policies in the international economic and political conjuncture, measures related to the country's production structure and basic strategic inputs such as imported energy resources have great importance in guiding economic activities (İstanbul Sanayı Odası, 2008).

According to an International Energy Agency assessment, effective policies and long-term energy plans should be developed in order to lessen Türkiye's dependency on foreign energy. These tactics should be founded on scientific estimates, designed deliberately, and implemented forcefully. The report also stresses that a method that considers the interests of fields such as economy, environment, and foreign policy should be used (IEA, 2005).

The energy relations between Türkiye and Russia should be examined in the context of these countries' regional strategies.

There is contrast and economic antagonism in every region of the world between the Russian Federation and the USA. In this case, the Black Sea Region is critically important for Russia in the energy field. The recently announced high reserve status in the Black Sea Region and the fact that the region is in a very

important location for energy transportation make this region to be a preferred area. Russia does not want the USA and NATO in this region. Russia is looking for safe countries to be a monopoly supplier in the region and for transportation. When this issue is taken into consideration, Türkiye becomes the first country that can cooperate with the Russian Federation (IEA, 2018).

### 3.3. Türkiye-Russia Energy Cooperation

In terms of energy geopolitics, Türkiye plays an important role for Russia. Türkiye is both a consumer and a transit country for energy distribution. Türkiye has a great advantage in having the Bosporus and the Dardanelles; these Straits are the key points in energy transfer to the Black Sea. From a geopolitical standpoint, Türkiye has 72% of the world's natural gas reserves and 73% of the world's proved oil reserves. With its proven energy reserves in the Middle East and Caspian Basin, Türkiye creates a natural energy bridge between energy resource countries and consumer markets. Türkiye, in addition to providing access to the Black Sea, serves as a "bridge" between Central Asia, the Caucasus, and Europe (Energy, 2019).

Unlike Russia, as a transit country, Türkiye has direct access to the Caspian Sea and international ports and is an established exporter to the West. In this direction, various energy cooperations have been and will be realized to make energy policies common between the Republic of Türkiye and the Russian Federation.

#### 3.3.1. Cooperation in Coal

Türkiye's hard coal production in 2020-2021was 101 thousand 632 tons. Coal production and consumption in Türkiye show an increasing trend. Therefore, this increase accelerates the consumption of lignite coal production and thermal power plants. Contrary to popular belief, Türkiye is not self-sufficient in producing and consuming all coal resources. Therefore, Türkiye realizes 60% of its hard coal imports from Russia (Enerji ve Kömür, 2022).

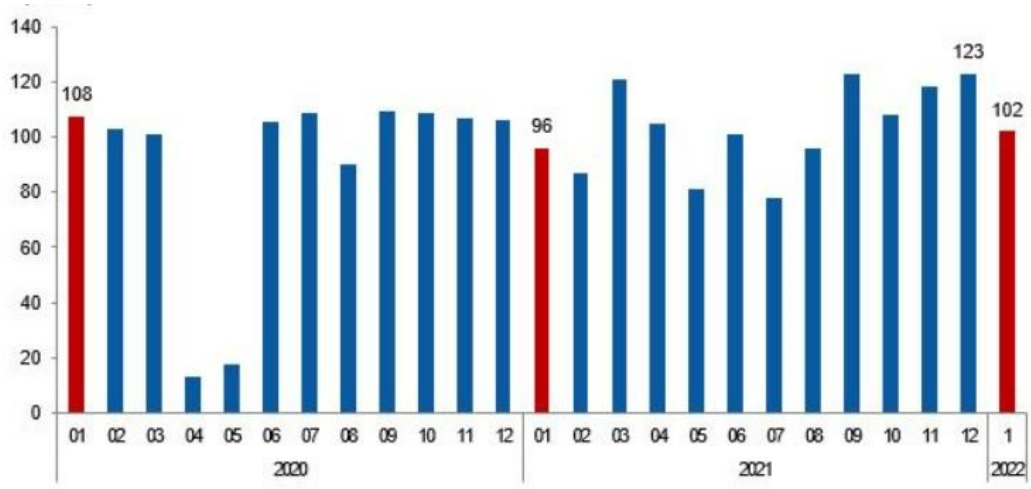


**Figure 0-10. 2012-2021 Hard Coal Production of Türkiye**

**Source:** TUIK, 2022

### 3.3.2. Cooperation in Oil

Türkiye's dependence on solid fuels such as wood and coal is 41%, oil is 92%, and natural gas is 99%. The general foreign dependency is 74% (Tiftikçioğlu & Yesevi, 2014)

Türkiye's domestic producible oil reserve in 2021 was 22 million barrels; even if discoveries are made, Türkiye's annual consumption is 31.3 million tons. In 2021, Türkiye met 16% of the oil it needed from Russia (EPDK, Turkish Natural Gas Market Raport, 2021).

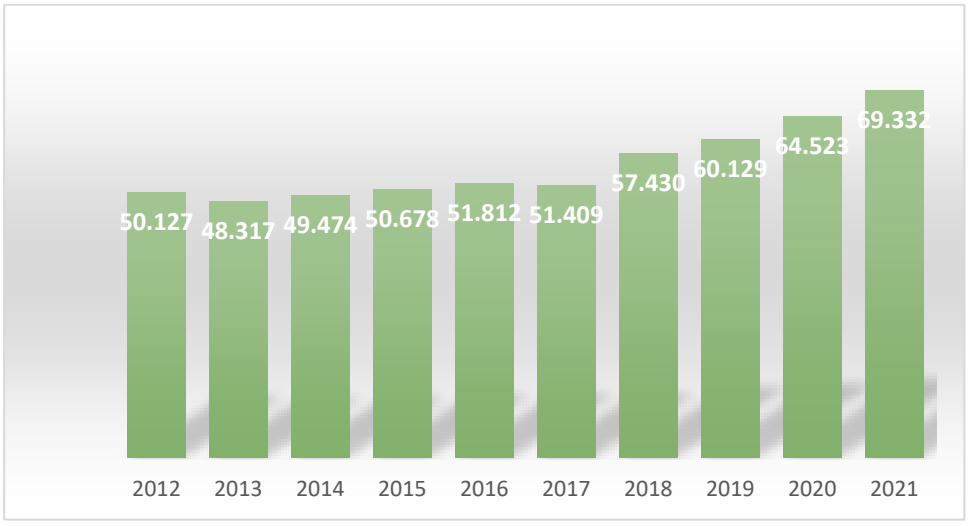


**Figure 0-11. 2012-2021 Crude Oil Production of Türkiye**

**Source:** TUIK, 2021

### 3.3.3. Cooperation in Natural Gas

The ratio of Türkiye's domestic natural gas production to total natural gas supply in 2021 decreased compared to the previous year and stood at 0.7%. Natural gas production, which increased to 1 billion m3 in 2008, was 441 million m3 in 2020 and 415 million m3 in 2021. On the other hand, natural gas consumption was 59.6 billion m3 in total in 2021, while natural gas imports amounted to approximately 59.2 billion m3. Türkiye's dependence on imports in natural gas supply increased compared to the previous year and became 99.3% (TP, 2021)

The rate of foreign dependency on natural gas consumption is higher than oil, and imports meet approximately 99.3% of Türkiye's natural gas consumption. While approximately 59.6 billion m3 of natural gas was consumed in Türkiye in 2021, only 0.7% (415 million m) of this figure was met by domestic production.

As of the end of 2021, natural gas reserves in Türkiye's land areas were recorded as a 3.1 billion m3 gas field discovered. Drilled by the Fatih Drilling Ship at a water depth of 2,115 m, the discovery in the Danube-1 well was recorded as the largest discovery in Turkish sea searches. This is also the largest hydrocarbon discovery in the Black Sea and ranks second among the global discoveries made in 2020. Following the second exploration with a reserve of 135 billion m3 in the Amasra-1 well located in the Black Sea on June 4, 2021, the total reserves in the Black Sea reached 540 billion m3 (TP, 2021).

Within the scope of activities aimed at meeting Türkiye's ever-increasing natural gas need from domestic resources, exploration activities in recent years have gained great momentum in the underexplored basins and especially in the sea areas of the Mediterranean and Black Seas (EMRA, 2021).

On the other hand, natural gas comes first among the goods imported from Russia. Türkiye is highly dependent on Russia for natural gas imports. Türkiye makes various energy agreements with Russia to ensure energy supply security. Therefore, for Türkiye, Russia was seen as a supplier with the capacity to meet most of the energy it needs and a reliable partner.

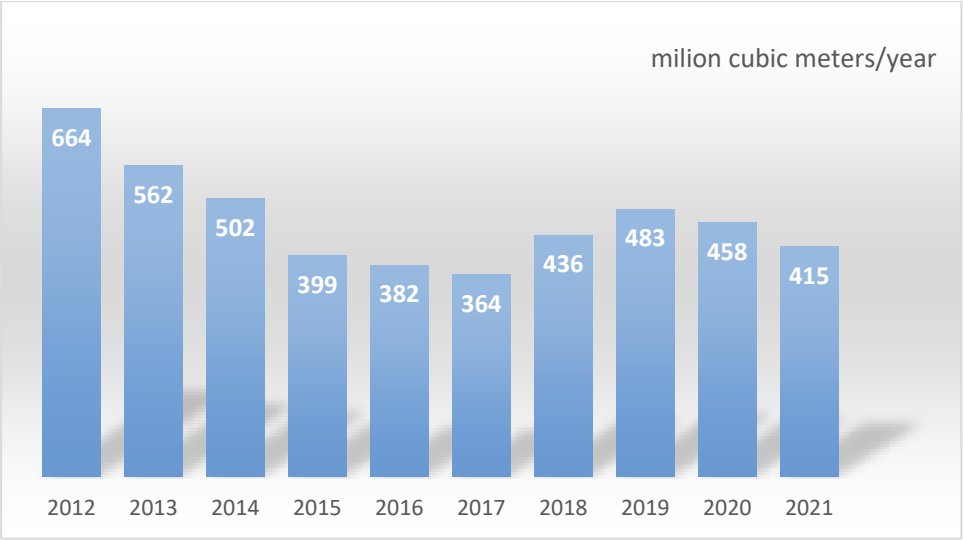


**Figure 0-12. Natural Gas Production of Türkiye**

Source: TUİK, 2021

### 3.3.3.1. Blue Stream Project

Blue Stream transfers natural gas from Russia to Türkiye. The pipeline, with a cost of US$ 3.3 billion, was built by Blue Stream Pipeline BV, established by the partnership of Gazprom (Russia) and ENI (Italy), and is operated by BOTAŞ and Gazprom. Thanks to this pipeline, Türkiye can supply natural gas from Russia without the intermediation of third countries. 396 kilometers of the 1207-kilometer pipeline passes under the Black Sea. In line with the agreement signed with the Russian Federation in 1997, Türkiye undertakes to purchase 16 billion m3 of natural gas annually from this country. The pipeline was put into operation in 2003 and officially opened in 2005. However, many experts worry that this cooperation makes Türkiye extremely dependent on Russia for energy (BOTAŞ, 2022).

However, it is on the agenda to develop the Blue Stream pipeline by adding two possible connection pipelines. First, the Blue Stream could be extended to İzmir and Ceyhan, allowing natural gas to be liquefied and exported by tankers. The second one could make it possible to sell natural gas to Greece and other European countries through a pipeline under the Aegean Sea. However, the current agreement between the two countries prevents Türkiye from selling to third countries without

the agreement of Russia (reexport ban). The projects in question are of a nature that will facilitate Türkiye's becoming a natural energy center (Tsereteli, 2005).

### 3.3.3.2. Turk Stream Project

The South Stream project, which was supposed to transport Russian gas to Europe across the Black Sea, has been scrapped. The cancellation of the South Stream Project and the announcement of a new project, called TurkStream, replacing this project with the same amount of natural gas, took place on December 1, 2014, during Russian President Putin's visit to Türkiye and had wide coverage in the European press. The reasons for the cancellation of the South Stream, 931 km of which is planned to pass under the Black Sea and 1455 km of which is planned to pass through the European continent, and why the TurkStream, consisting of four lines in total, has been preferred. Currently, the Blue Stream and the West Line, two lines through which Türkiye receives natural gas from Russia, continue their functions. In this regard, although the issue of the project route has not been clarified yet, it has been announced that the annual 14 billion cubic meters of natural gas taken from the Western Line will be transferred to the TurkStream (Yesevi, 2018).

Russia's energy policy has started to change by developing alternatives to the USA and the EU embargoes. Although the EU countries' high dependence on Russian natural gas strengthens Russia's hand in a sense, the fact that the EU has started to meet its energy needs from different resources (renewable energy, shale gas) and routes has created a threat for Russia. In addition, Bulgaria, which was going to allow the South Stream to enter Europe, sided with the EU, of which it is a member, in the sanctions against Russia. This was one of the leading factors that led to the cancellation of the project. The cancellation of the South Stream has put Russia in a critical position against the USA and the EU countries (Efegil & Özsavaş, 2020).

Russia had to search for new energy routes. One of the most important aspects of these searches is the statement that the natural gas sent by Russia to the European market will not be sent via Ukraine. The TurkStream project, which emerged due to Russia's trust in Türkiye in the land area, is important in creating a new route in

energy transfer and positively affects the relations between the two countries. In addition, a Russian energy company is building the Akkuyu Nuclear Power Plant, Türkiye's first nuclear power plant, adding a new dimension to bilateral relations. In addition to the fact that energy is a strategic weapon in foreign policy, the financial gain it provides to the relevant countries is among the main reasons for the agreements made in the relations between the countries. In this sense, the presence of high-cost items of the South Stream was effective at the beginning of why the TurkStream was preferred (Yesevi, 2018).

The shortening of the pipeline, passing under the Black Sea, together with the TurkStream, and the cost-saving it offers, is an important opportunity for Russia, which is in a difficult situation from an economic perspective. The first pipelines forming the TurkStream Offshore Natural Gas Pipeline entered Türkiye's Exclusive Zone on November 4, 2017. Therefore, according to the statement made by TurkStream, the ship Pioneering Spirit, which carried out the subsea pipe laying, completed the part of the project in the exclusive economic zone of Russia and moved to the exclusive economic zone of Türkiye. As a symbol of the transition between the exclusive economic zones of Türkiye and Russia, the ship in question was placed on the seabed with a pipe section depicting the flags of both countries. In the project, which consists of two lines, a total of 448 kilometers was covered, 224 kilometers on each line, while the construction of approximately 25 percent of the project was completed in less than six months. The ship Pioneering Spirit owned by the company Allseas entered the Black Sea by passing through the Bosphorus on May 7, 2017. On June 23, 2017, Russian Federation President Vladimir Putin officially initiated the ship's work (Yeşilot, 2021).

According to the memorandum of understanding signed between Gazprom and BOTAŞ, the goal is to transfer 63 billion cubic meters of natural gas through the TurkStream project, 15 billion cubic meters of which will be stored in Türkiye and approximately 48 billion cubic meters in Greece. Currently, 16 billion cubic meters of natural gas flow from Russia to Türkiye via the Blue Stream pipeline. In this sense, the TurkStream project, which will provide an annual natural gas flow of 63 billion cubic meters, will have critical importance for Russia, Türkiye and EU countries within the scope of energy supply security (Şahin & Nuriyev, 2021).

#### 3.3.3.3. Russia – Türkiye Natural Gas Pipeline (West Line)

The West Line Project, the construction of which started with the agreement signed between the Republic of Türkiye and the Former Soviet Union on February 14, 1986, is the first natural gas agreement and the first natural gas pipeline between Türkiye and the Russian Federation. This line is the outcome of Türkiye's search for alternative energy resources concluded with an intergovernmental agreement as a result of the negotiations with the Former Soviet Union. Since 1987, natural gas has been purchased gradually, and the maximum amount of 6 billion m3/year was reached in 1993.

The total length of the line is 845 km. It starts from the Malkoçlar region, which is the border of Türkiye with Bulgaria and follows the route of Hamitabat, Ambarlı, Istanbul, Izmit, Bursa and Eskisehir (Stein, 2013).

### 3.3.4. Cooperation in Nuclear Energy

In its report titled "Nuclear Power Plants and Information on Nuclear Power Plants to be Established in our Country", MENR justified Türkiye's need for nuclear power generation as follows: "Countries that obtain energy cheaply, with high quality and sustainably are at the forefront of the global trade and development race. For this reason, our country, which ranks second as a country with a population of 75 million after China, which has an average annual energy demand increase of around 7–8% and a population of around 1.4 billion in electricity demand increase in the world, should definitely add nuclear energy to its energy supply basket." The report also stated that nuclear energy is important in ensuring Türkiye's energy supply security, reducing its dependence on energy imports and the current account deficit. (Yavuzaslan, 2019).

Nuclear cooperation between Türkiye and Russia is still on the agenda. "Agreement on Cooperation on the Establishment and Operation of a Nuclear Power Plant in Akkuyu Field" was signed between Türkiye and Russia on 12 May 2010. Accordingly, the executing Russian company ASE will initially establish and

operate a nuclear power plant consisting of four VVER 1200/491 type (AES-2006 design) nuclear power reactors with a total capacity of 4800 MWe at Mersin Akkuyu Field, with entirely Russian capital. (T.C ETKB, 2022)

It is feasible to state that Türkiye's reliance on Russia is exceedingly great. In this regard, Türkiye must diversify its resources in order to ensure energy supply security. At this point, nuclear energy stands out as an important alternative, especially in resource diversification, as will be discussed in depth in Türkiye below.

#### 3.3.4.1. The Akkuyu Nuclear Power Plant Project

The Akkuyu Nuclear Power Plant is a project signed by the governments of the Republic of Türkiye and the Russian Federation, and its operation is mutually agreed upon. According to the agreement signed on 12 May 2010, the Nuclear Power Plant (NPP) in Mersin Akkuyu Field will be built on 4 VVER 1200 type reactors with a total installed power of 4800 MW. After the agreement, the Project Company (Akkuyu Nuclear A.Ş.) was established on 13 December 2010 and is a joint stock company that owns its activities (T.C ETKB, 2021).

The foundation of the first reactor of Akkuyu Nuclear Power Plant was laid on July 21, 2022, and the fourth and last reactor will be commissioned on the centennial of the Republic. Thousands of employees in the field are making a great effort to ensure that Türkiye's largest project progresses in accordance with the deadlines set. The main purpose is to commission the first reactor in 2023, in line with the project schedule, with the supervision and approval of the Nuclear Regulatory Authority, with reference to international standards.

Within this project's scope, selected Turkish students are sent to Russia for 6-year nuclear engineering education. 5,5 years of this period is dedicated to specialization education. The students who are successful in this education receive a 6-month graduate education. To date, 317 students have been sent to Russia for nuclear energy education to train engineers with the knowledge and experience to establish and operate Türkiye's future nuclear power plants. 263 engineers have

completed their training and are working on the Akkuyu Project. 54 students continue their education in Russia. However, on July 26, Russia terminated the engineering purchase and construction contract with IC İçtaş from Türkiye for the Akkuyu Nuclear Power Plant, which is under construction in Mersin. Making the first statement on the reasons for the cancellation of the contract on August 5, Rosatom stated that IC İçtaş had committed "contract violations" that affected the quality and delivery time of the project (BBC, 2020).

Türkiye has been working on nuclear energy since the 1970s. Türkiye took the first steps after the Geneva Summit in 1955. The “Atomic Energy Commission" was founded under the Office of the Presidency in 1956 and became a member of the International Atomic Energy Agency in 1957. A research reactor was established in Istanbul in 1962. At the beginning of 1972, the Nuclear Energy Department of the Turkish Electricity Authority started to operate. In this historical adventure, the Nuclear Power Plant Project was not on the agenda for the first time in 2010. The Akkuyu Nuclear Power Plant Project was published in the Official Gazette and included in the investment program in January 1993 (Yavuzaslan, 2019).

The Russian Federation has always desired to be strong in nuclear energy since the Soviet Union. However, the Chernobyl disaster in 1986 negatively affected the former Soviet Union and the current Russian Federation and Türkiye. Nuclear energy offers advantages as well as disadvantages. One of the advantages is that nuclear power generation emits much less carbon dioxide than other technologies that produce electricity using coal, natural gas or oil. In other words, since the greenhouse gas emissions of nuclear power plants are less, their accelerating effects on global warming are lower. A significant amount of electrical energy can be obtained from a nuclear power plant. However, there are also disadvantages. What should be done with nuclear waste generated by nuclear power plants is still an open question. These extremely hazardous wastes must be carefully stored. Despite strict safety regulations, nuclear power remains a high-risk technology. Accidents continue to occur, such as the Fukushima nuclear disaster in Japan. There is no nuclear power plant that is completely safe.The consequences of accidents in nuclear power plants are very destructive for both nature and human

beings. However, nuclear power plants pose a great danger against attacks that may come from outside and their own risks. The consequences of any terrorist act targeting a nuclear power plant will be severe (Akkuyu Nükleer, 2015)

The Akkuyu Nuclear Power Plant Project is an important breakthrough for the two countries that have adopted the idea that the greatest power and energy of the future world will be through nuclear power. This project will be realized according to the Build-Operate-Transfer (BOT) principle. Türkiye's Ministry of Energy and Natural Resources dated its policy as Build-Operate with a press release on August 2, 2022 (T.C ETKB, 2022).

To summarize, the Akkuyu Nuclear Power Plant Project is the most important joint project of nearly 500 years of relations between Türkiye and Russia. It is not only a technical but also a political project. The Akkuyu Nuclear Power Plant project alone is expected to meet approximately 7 percent of Türkiye's energy needs. It is also a historical project. Thanks to Russia, Türkiye has risen to a new era and is now a player in the league of nuclear energy. However, there are disadvantages as well as advantages of having nuclear energy. There are lobbies in Russia and Türkiye and the Western world that do not want Türkiye to have nuclear energy. For this reason, the Akkuyu Nuclear Power Plant Project has been carried out very slowly since 2010 (T.C ETKB, 2021).

**Project History**

- On May 12, 2010, the “Agreement on Cooperation between the Government of the Republic of Türkiye and the Government of the Russian Federation on the Establishment and Operation of a Nuclear Power Plant in the Akkuyu Field in the Republic of Türkiye” was signed.
- The Project Company was established on 13 December 2010.
- The Akkuyu Field was allocated to the Project Company in 2011.
- TAEK approved the updated Location Report on 6 December 2013.
- On 1 December 2014, the positive decision on the "Environmental Impact Assessment (EIA) Report" was taken.
- The Field Parameters Report was approved by the Turkish Atomic Energy Agency (TAEK) on February 9, 2017.
- On March 3, 2017, a "Construction License" application was made to TAEK for the first unit.
- On 15 June 2017, the Energy Market Regulatory Authority (EMRA) granted the Electricity Production License.

- On 19 October 2017, the “Limited Work Permit” was obtained for the first unit from TAEK.
- On 17 November 2017, the reactor foundation excavation, drilling works and concrete pouring under the foundation of Reactor No. 1 were completed.
- On 30 December 2017, the Electricity Purchase Agreement was signed between the Project Company and TETAŞ.
- On March 12, 2018, the first group of students who received education in nuclear engineering in Russia graduated.
- On April 2, 2018, A "Construction License" was given for Unit 1 of NGS construction by TAEK.
- On April 3, 2018, the first concrete was poured into the 1st Unit of Akkuyu Nuclear Power Plant. The basic construction of the first unit has already been completed.
- On 30 November 2018, the "Limited Work Permit" was obtained for the second unit.
- On March 28, 2019, the "Construction License" application was made for the third unit.
- On May 9, 2019, the "Temporary Operation Permit" was obtained for the eastern cargo terminal.
- On July 24, 2019, the first large-sized equipment, “Core Holder”, arrived at the Akkuyu site.
- On August 26, 2019, the "Construction License" of the second unit was granted.
- On October 26, 2019, the assembly of the core holder, one of the first unit's most important equipment in terms of nuclear safety, was completed.
- On April 8, 2020, the foundation of the second unit was laid.
- On May 12, 2020, the "Construction License" application was made for the fourth unit.
- On 26 June 2020, the installation of the second floor of the internal protection structure of the first unit reactor building was completed.
- On 13 November 2020, the construction license of the third unit was granted.
- On March 10, 2021, the foundation of the third unit was laid.
- On October 28, 2021, the fourth unit was licensed by NDK.
- 08 December 2021, the foundation of the pumping station of the first unit was laid.
- On January 15, 2022, the steam generators of the second power unit reached the Akkuyu field.
- On 01 February 2022, the reactor pressure vessel of the second power unit reached the Akkuyu site.
- On March 21, 2022, the main assembly started in the first unit of NGS.

# 4. CONCLUSION

One of the most important priorities of a developing and growing Türkiye is energy. Türkiye must meet its current energy needs and plan for the future. In this context, the Sakarya Gas Field Development Project, being Türkiye's largest project in the field of energy, is of vital importance for Türkiye's energy independence and to become a net exporter in the future.

The relations between Türkiye and Russia have been on a course of ups and downs almost every period. The course of bilateral relations in the historical process is on war and disagreements. While the disagreements between the two countries stemmed from geopolitical competition in certain regions, economy and trade, especially the energy sector, continued to be the main areas of cooperation. In this context, Türkiye made a choice to meet most of its energy needs from Russia in the 2000s. This choice has been an important factor in determining the future of Türkiye’s economic and commercial relations with Russia. Therefore, Türkiye-Russia relations in the energy field have developed positively within the scope of the ongoing projects and the projects planned for the future. The ongoing efforts to realize the TurkStream Project and the construction of the Akkuyu Nuclear Power Plant in the recent period can be interpreted as a concrete indication that both countries should continue their strategic energy partnership in the long run.

Despite the political tensions between Ankara and Moscow, energy-oriented economic relations contributed positively to resolving tensions within a short time. For example, Türkiye and Russia have different political perspectives on the solution to the Syrian issue and Türkiye's downing of the Russian plane on 24 November 2015 revealed these political tensions. However, even though the relations between Türkiye and Russia had come to a breaking point, Türkiye continued to meet most of its energy needs from Russia. Although Russia implemented measures for some commercial areas other than energy exchange, this did not greatly hinder these two countries' economic interests.

Türkiye has always been a geopolitically important country for Russia. Therefore, Türkiye and Russia's mutual energy-based economic interests have contributed positively to their economic relations. Türkiye acts as a bridge for the transmission of natural gas to Europe. In addition, the strategic requirements of

Russia for a smooth transition from Türkiye's Straits to the warm seas contribute to maintaining positive relations.

From a strategic partnership framework perspective, partnerships in international politics mean that bilateral relations move beyond cooperation or alliance. Partnerships are a long-term building activity in which two states unite around a common mission in the international arena. Therefore, since partnerships are about uniting around a mission, relationships must be based on trust for the long term.

Initially, I thought that the relations between Türkiye and Russia has been strategic partnership. However, in the end of my research considering historical problems and disagreements, I found that the relations between Türkiye and Russia has been strategic cooperation.

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