KADİR HAS UNIVERSITY
SCHOOL OF GRADUATE STUDIES
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ANALYSIS OF THE LIBERALIZATION OF THE TURKISH NATURAL GAS MARKET

ETHEM UĞUR

MASTER'S THESIS

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MASTER'S THESIS

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ACCEPTANCE AND APPROVAL

This work entitled **ANALYSIS OF THE LIBERALIZATION OF THE TURKISH NATURAL GAS MARKET** prepared by **ETHEM UĞUR** has been judged to be successful at the defense exam held on 10/01/2023 and accepted by our jury as **MASTER'S THESIS**.

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Hereby declare that this Master's Thesis is my own original work and that due references have been approximately provided on all supporting literature and resources.

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ANALYSIS OF THE LIBERALIZATION OF THE TURKISH NATURAL GAS MARKET

ABSTRACT

Natural gas is used as a bridge fuel during the ongoing transition from fossil fuels to renewables because it produces less carbon emissions than oil and coal. In addition, countries, which are aiming to become more carbon neutral, are replacing coal with natural gas. These reasons have led the natural gas industry to grow and the gas business has gained an international dimension. In order to keep up with these developments, countries liberalize their gas markets by opening them to competition. The two important pillars of liberalization are third-party access to the physical infrastructure and the demolition of monopolies in the market. The European Union (EU) has implemented a series of reforms to be able to fully liberalize its internal gas markets. Turkey, the fourth largest gas-consuming country in Europe, has also made a series of reforms in order to harmonize with Europe during the EU accession process since 2001. However, Turkey's goals to open its internal gas market to competition have only been partially achieved. The main purpose of this study is to analyze the performance of the Turkish natural gas market and to determine to what extent gas market reforms have been successful. The results of a detailed examination of the market and the survey carried out among the major market players have shown that the Turkish natural gas market should be improved in transparency, competitiveness, and cost-based pricing.

Keywords: Turkish natural gas market, liberalization, reforms, performance analysis

TÜRKİYE DOĞAL GAZ PİYASASININ SERBESTLEŞTİRİLMESİNİN ANALİZİ

ÖZET

Doğal gaz, petrol ve kömüre göre daha az karbon emisyonu ürettiği için fosil yakıtlardan yenilenebilir enerjiye geçiş sürecinde köprü yakıt olarak kullanılmaktadır. Daha düşük karbon salımı ile karbon nötr olmayı hedefleyen ülkeler ise doğal gazı kömüre ikame olarak değerlendirmektedir. Belirtilen sebepler doğal gaz sektörünün büyümesini sağlamış ve doğal gaz ticareti uluslararası bir boyut kazanmıştır. Ülkeler bu gelişmelere ayak uydurabilmek için doğal gaz piyasalarını rekabete açarak serbesleştirmektedir. Yerel pazarı rekabete açmak genel olarak "liberalleşme" olarak bilinmektedir. Liberalleşmenin iki önemli ayağı, harici kullanıcıların fiziki altyapıya erişiminin sağlanması ve piyasadaki tekel oyuncuların paylarının azaltılmasıdır. Avrupa Birliği (AB), rekabetçi gaz piyasaları oluşturmak için bir dizi reformu hayata geçirmiştir. Avrupa'nın en büyük dördüncü doğal gaz tüketicisi olan Türkiye de, 2001 yılından itibaren Avrupa Birliği üyelik süreci kapsamında AB'ye uyum sağlamak için bir dizi reform gerçekleştirmiştir. Ancak Türkiye'nin doğal gaz piyasasını serbestleştirme hedefine kısmen ulaşılabilmiştir. Bu çalışmanın temel amacı, Türkiye gaz piyasası reformlarını inceleyerek Türkiye'nin bu reformları ne ölçüde gerçekleştirdiği incelenmektedir. Doğal gaz piyasasının uzmanlarıyla Türkiye doğal gaz piyasasının değerlendirilmesi konusunda yapılan anketin sonuçları, piyasanın şeffaflık, rekabetçilik ve maliyet esaslı fiyatlama gibi konularda ilerleme kaydetmesinin gerektiğini göstermiştir.

Anahtar Sözcükler: Türkiye doğal gaz piyasası, liberalizasyon, performans analizi

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ACER – The European Union Agency for the Cooperation of Energy Regulators

Bcm - Billion cubic meters

BOTAS – Petroleum Pipeline Company of Türkiye

BOO – Build-own-operate

BOT – Build-operate-transfer

CIS – Commonwealth of Independent States

EFET – The European Federation of Energy Traders

EMRA – Energy Market Regulation Authority

ENTSO - European networks for transmission system operators

EXIST – Turkish energy exchange

FSRU – Floating storage and regasification unit

GTS – Gasunie Transport Services B.V

GCV – Gross calorific value

LNG – Liquefied natural gas

Mcm – Million cubic meters

MENR – Ministry of Energy and Natural Resources

NPB – National Balancing Point

Scm – Standart Cubic Meters

SCP – Southern Gas Corridor

TANAP – Trans Anatolian Gas Pipeline

TAP – Trans Adriatic Pipeline

TOR – Transfer of operating rights

TTF – Title Transfer Facility

1. INTRODUCTION

Energy is vital for improving human welfare and raising living standards; it drives economies and sustains societies (UNDP et al., 2000). Developing technologies and growing populations are some of the reasons for the increased demand for energy. Demand for energy is therefore growing every year. Throughout the history, humans have witnessed several transitions from one energy source to another. Wood was the first and most commonly used vital source of energy in the beginning of human history (FAO, 2017). The invention of coal extraction prompted the transition from wood to coal which started with the industrial revolution initiated by Great Britain in the 18th century (Allen, 2013). After the discovery of oil with the first well drilled by Edwin Drake in the U.S., demand for oil rose rapidly and the share of oil in the global energy mix became higher than coal after 1965 (Melsted and Paullua, 2018). Later, natural gas began increasing its share in energy basket of almost all countries (Victor et al. 2006) There is a strong relationship between choice of fuels and fuel-switching in residential consumer groups in OECD countries (Haas et. al., 1998; Krichene, 2002).

Today, we are in another transition period from fossil fuels to renewable energy because of the problems created by fossil fuels such as geopolitical instability, adverse environmental effects (i.e. climate change) and resource scarcity (Ediger, 2018). However, this transition will not be easy because of the high dependence of the global energy system on fossil fuels (82.3%) (BP, 2022).

To deal with the challenges of fossil fuels, the world has been trying to take collective measures to reduce the negative impacts of these fuels. The 2015 Paris Agreement was the first global action on climate change that brought international legal obligations on all countries (Dimitrov, 2016; Horowitz, 2016). A great example of political commitment has been seen in Europe. The European Union (EU) quickly responded to climate change and has continuously implemented a series of reforms and policies. The European Green Deal is a big target for the EU which aims to make Europe a climate neutral continent. To reach this target, EU Member States pledged to reduce emissions by at least 55% by 2030, compared to 1990 levels (European Commision, 2020). Switching from fossil fuels

to 100% renewable energy supplies seems possible, at least in some regions, but there will be some challenges to overcome (Singer, 2011; PWC, 2010). At present, moving away from fossil fuels completely is not easy since some countries and regions are still heavily dependent on fossil fuels in their energy mix. Therefore, when electricity generation gradually shifts to renewables, natural gas will play an important role. And because natural gas is easily harmonized with renewables, this makes carbon neutral goals possible (BP, 2022; Bistline and Young, 2022; IEA, 2019).

Natural gas is a potential candidate to support renewable energy sources during the energy transition period because it is one of the cleanest fossil fuels. It is called a bridge fuel for the energy transition period (Ogden et al., 2018; Hausfather, 2015). When it is burnt, it releases less carbon emissions than coal and oil (**Figure 1.1**). Furthermore, when cooled to -162 ºC, it can be liquefied (LNG) and can be transported via ships, trucks and trains (Shell, 2022).

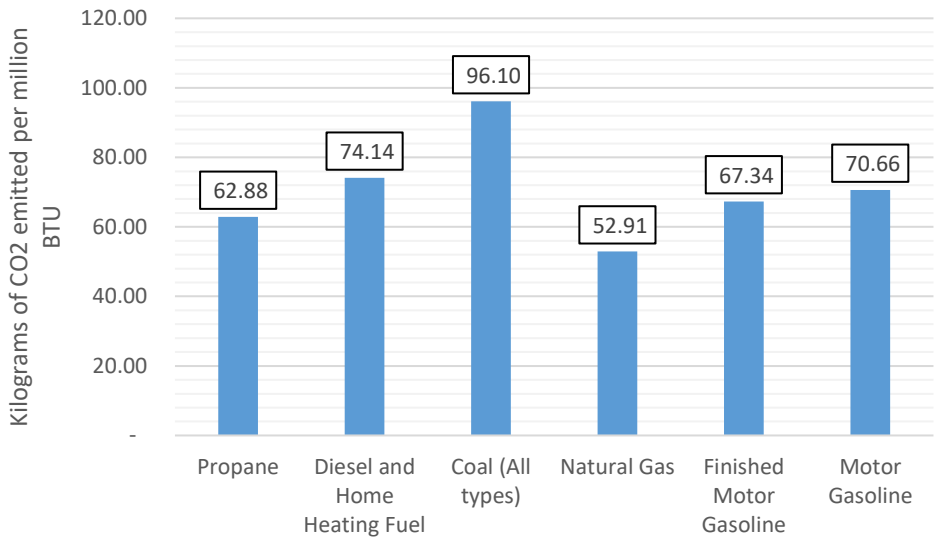


Figure 1. 1 CO2 emissions coefficients

Source: U.S. Energy Information Administration, 2022

At present natural gas is mostly used in industrial and residential areas in the world (**Figure 1.2**). Since natural gas has a better Gross Calorific Value (GCV), it is used in energy intensive industries (e.g cement and steel) and in electricity generation, such as

gas-fired power plants. Natural gas is alsoconsidered a back-up fuel for industries when there are energy-deficiency problems.

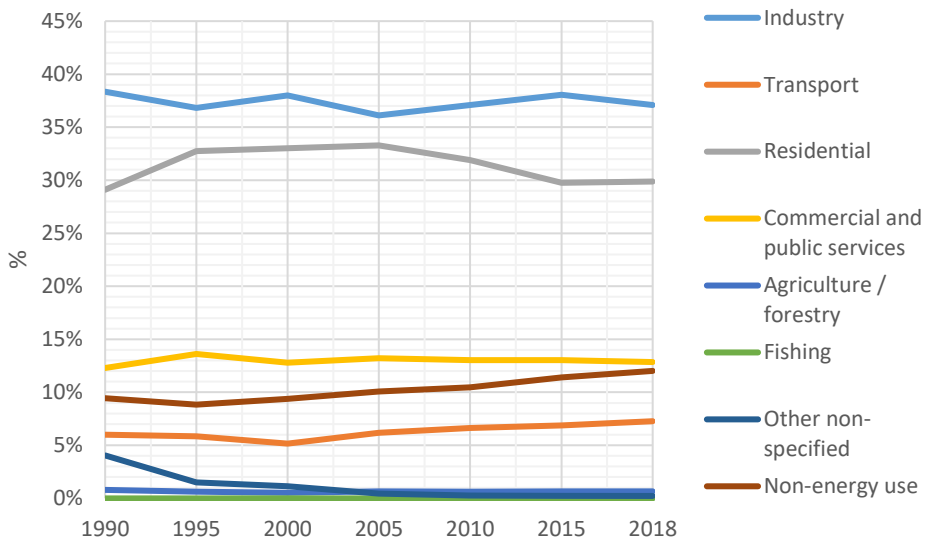


Figure 1. 2 Final natural gas consumption by sector in the world

Source: IEA, 2020

At present, natural gas has gained an international dimension and, virtual and physical gas hubs have been created by many countries around the world for gas-to-gas competition. This is important because gas markets cut ties with oil markets, separating gas from oil markets and its derivatives. However, building gas-to-gas competition needs fundamental changes in internal energy markets. This is generally called market reform or market liberalization. Opening internal gas markets to competition is not an easy task. The U.S., the UK and some European countries have already achieved the opening of their markets by implementing reforms.

Türkiye has tried to follow in the footsteps of those countries. In parallel with reforms in the EU, Türkiye started to make series of reforms to be able to liberalize internal energy markets. An important step was taken for liberalization of the Turkish natural gas market by enacting Natural Gas Market Law No: 4646, which published in the Official Gazette in 2001. After the Natural Gas Market Law, the Energy Market Regulatory Authortiy has been determined as sole responsibility and authority of the energy market with the purpose of creating and supervising a financially strong, stable and transparent market, and also aiming to provide natural gas to end-users within the framework of high quality,

continuous and competition principles. With enacting of the gas market law, the urban natural gas distribution tender processes were speed up, and transmission network owned by BOTAŞ was opened to third party access in 2004. The first contract release tender was made in 2005, and BOTAŞ transferred some of the gas contract made by Russian state-owned company Gazprom to private sector in 2007. Aggreagete transferred amount was realized as 4 bcm between 2007 and 2009 and the private companies started to use the transmission network. In 2009, the regulation regarding the access of third parties to LNG terminals was published by EMRA, and it was entered into force in 2010. In parallel with these steps, BOTAŞ did not extend a gas contract, which was 6 billion cubic meters annual gas purchase, signed with Gazprom Export on Wester Line in 2011. It was an inportant development for gas market since the share of the private sector was significantly insrease in the natural gas market and new companies entered the market. In 2013, this capacity transferred to private sector and new market players has taken its place on the way of the liberalized natural gas market. In 2016, as an another important step, the first FSRU project was commisioned by the private sector. In addition to all these effort, the Organized Natural Gas Wholesale Market (i.e., spot natural gas market) was launched under Enerji Piayasaları İşletme A.Ş. (EPİAŞ). Although introducing the spot market has shown Türkiye's gas hub ambition, today gas exchange platform is not considered as an active market taking into account transactions on the platform. Considering of all these good faith and great efforts, unfortunately Turkish natural gas market is not a mature market and BOTAŞ market share is around 96% as of today. In addition, companies do not have fully or partially access to some facilities such as LNG terminals and underground storage facilities. Lacking of transparency and cost-based price methodology lead to drive private companies out of the gas market. Therefore, private companies share has gradually decreased over the years.

This thesis examines Turkish market reform to see to what extent Türkiye has achieved natural gas market reforms, in particular liberalization goals. The main research question of this thesis is: "Did Turkish reforms make significant impacts on the development of a well-functioning natural gas market?" and "What should Türkiye do in order to improve its natural gas policies towards having a well-functioning market?"

To answer these questions, I first analyzed European energy directives and regulations in an effort to understand effective implementation of a well-functioning natural gas market, and took it as a role model for Türkiye. I then evaluated how these reforms have shaped European gas and electricity markets and how these policies and reforms have contributed to Europe's natural gas security. I will use their best practices to improve Türkiye's natural gas market. I also conducted a survey among major players of the Turkish gas market to evaluate their opinions.

There are several publications about the Turkish natural gas market, however, the majority of the literature is dedicated to natural gas policy and security issues for Türkiye like natural gas import dependency, the importance of natural gas, development of natural gas business and Turkey's geopolitic importance. Hacisalihoglu (2008) and Demirbaş (2002) focus on Türkiye's strategic position in terms of natural gas imports from different exporting countries and also point out previous energy project financing and ownership: Build-Operate-Transfer (BOT), Build-Own-Operate (BOO) and Transfer of Operating Rights (TOR). Türkiye's strategic function as an "energy bridge" between energy exporting countries of the Caspian and Middle Eastern regions and energy importing countries, like those in Europe, is discussed by several authors (e.g., Kiliç, 2006; Ozturk et al., 2011; Austvik and Rzayeva, 2017; Erşen and Çelikpala, 2019; Çetin and Oguz, 2007). Some authors such as Melikoğlu (2013) discusses the contribution of natural gas pipelines to Türkiye's goal of becoming a transit hub between Asia and Europe.

Biresselioglu et al. (2012) discussed the issue of increasing the import share of Liqufied Natural Gas (LNG) in Türkiye. Erdoğdu (2007) studied the natural gas policies implemented in Türkiye. Türkiye's fossil fuel dependency and its historical backround are analyzed by Berk and Ediger (2018), Ediger and Akar (2007), Ediger and Berk (2011), and Ulutaş (2003). Çetin and Yüksel (2014) On the other hand, point out that the monopolistic power of BOTAŞ has led to a lack of competition and that this has created major problems related to the price of natural gas because it has never reflected real cost. Several authors have shown that growing natural gas demand in Türkiye is generally associated with a strong relationship between natural gas demand and economic growth (Şevik, 2015; Balat, 2008; Erdogdu, 2010; Beyca et al., 2019; Sen et al., 2019).

The majority of literature is dedicated to Turkiye's energy policy and security issues. Broadstock et al. (2020) shows that the degree of connectivity between the level of market integration and the energy policies produce positive outcomes over time. Ozturk et al. (2011) analysed energy policy compatibility in relation to the aim of becoming an energy bridge between importing and exporting countries. Accordşng to them, although Turkish policymakers set up a clear path for the liberalisation process, the short time span for the gas release, supply security issues and future demand for gas were not evaluated adequately before planning the program. According to Akçollu (2006), the Turkish gas release program is unique and it has proved impossible to achieve such high volume releases in such a short time. Rzayeva (2020) and Rzayeva et al. (2017 show that the legal framework of the Natural Gas Market Law has not been implemented and the market-opening objectives have not been achieved and a revision in the gas market law should be implemented to create a more liquid and secure market. Pollitt (2012) claim that only policies will contribute to a reduction in climate change and change energy consumption patterns. Türkiye has the ability and necessary conditions to fulfill the EU's objectives and to build a gas hub in the region Umucu et al. (2011) concluded that Türkiye's ambition to become a transit hub can only be achieved on a small-scale, good planning and setting realistic targets will make the long-standing goal of establishing Turkiye as a well-functioning gas hub on a large scale possible.

This study will contribute to the literature on the Turkish natural gas market by providing opinions and the first hand experiences of professionals who are familiar with the market. The structure of the paper is as follows: chapter 1 analyzes the global natural gas market, including natural gas outlook, evolution of liberal natural gas markets, the U.S. and European experience and the situation in the rest of the world. This chapter also includes information on European energy directives and regulations with a chronology of energy policies. Chapter 2 examines at natural gas market reforms in Türkiye, country energy profile and outlook for the internal natural gas market. Chapter 3 explains the survey on market reform performance, transparency, the role of the private sector in natural gas imports and compares the Turkish natural gas market with best practices. Finally, chapter 4 concludes the paper by giving some recommendations to improve Türkiye's natural gas market.

2. NATURAL GAS MARKETS IN THE WORLD

2.1 History of natural gas

Natural gas is one of the most important members of the hydrocarbon family. It is also the cleanest since it produces less carbon emissions compared to other fossil fuels like oil and coal. Long before its current, extensive use, it has been known since ancient times. Several sources say the history of natural gas starts before 211 B.C. when the Chinese used bamboo pipelines to transport natural gas for cooking (APGA, n.d). In addition, as Speight (2020) mentioned in his book, natural gas was an integral part of ancient religious ceremonies due to the importance of fire in religious life. For example, it is often said that natural gas wells were generally flared where people believe in the supernatural power of fire in religious life, exemplified by Persia and India.

While the first commercial journey of natural gas started through accidental discoveries in the United States, natural gas was first used commercially in Britain. In 1785, the British produced natural gas (i.e., Syngas) from coal in order to convert it into electricity for lighting houses and streets (APGA, n.d.). The Americans imported natural gas from Britain and also used it to illuminate streets in the early 1800s (Gas South, 2020a). William Hart, an American, was the first to harvest natural gas from an oil well in Fredonia, New York. His achievement triggered the establishment of America's first natural gas company, the Fredonia Gas Light Company. However, investors and entrepreneurs were then more interested in other fossil fuels, like coal and oil, because of economic expectations.

Until the realization of natural gas' potential as a source of energy and the development of advanced techniques to extract it from the ground, it had been used as flares which were blown off into the atmosphere (Waples, 2014). In 1885, a burner that mixed air with natural gas was invented by Robert Bunsen (Gas South, 2020b). This invention allowed natural gas to be used to heat homes and to make life easier for people. After Bunsen's invention, the potential of natural gas was considered vital for heating purposes, industry and electricity. Some time after, leakproof pipelines started to be built for commercial

purposes both domestically and internationally. However, the transportation of natural gas relied on intensive capital investment that made it harder to transport the gas, therefore the market was mostly dominated by long-term gas contracts (Bradshaw, 2009). The reason why producers generally use long-term agreements (e.g., 20 years) is to ensure get a return on their investments over the life cycle of gas projects in case of any embargos, changes in political relations or fluctuations in production cost (Thomas and Dawe, 2003). For example, the US' embargo on equipment used to supply gas to the Soviet pipeline was a solid example of governmental interference in preventing a deal between parties (Austvik, 1997). Although long-term gas contracts were preferred to ensure supply security in the past, market behavior is now different. With the expansion of the LNG market, more and more countries have preferred LNG shipments in recent years due to reasonable prices and supplier competition. For this reason, short term contracts will be more promising and countries will more open to flexible contracts.

2.2 World natural gas outlook

According to data provided by BP (2022), global primary energy consumption reached 595,15 exajoules, a 5.8% increase compared to 2021. The share of natural gas in the energy mix was around 24%, as compared to 25% in the previous year. The decrease in 2021 could be a result of the coronavirus outbreak since every industry was affected by the COVID-19 pandemic. When we analyze global proved natural gas reserves, they total 188.1 trillion cubic metres (tcm). Of those, 20.3 tcm are in OECD countries, 167.8 tcm are in non-OECD countries and 0.4 tcm are in the European Union, respectively. In particular, 70.40% of proved reserves are located in the CIS (Commonwealth of Independent States) and Middle East (**Figure 1.3**).

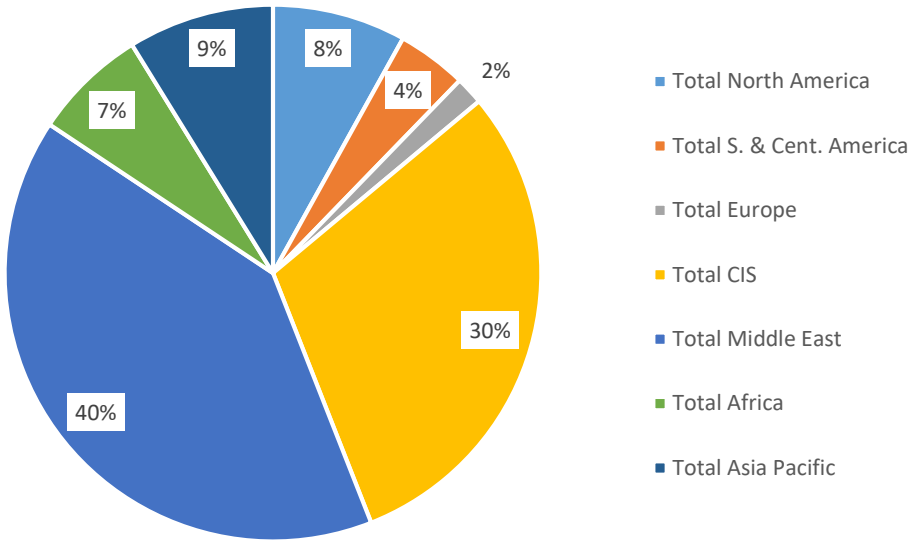


Figure 1. 3 The shares of proved natural gas reserves in the world

Source: BP, 2022

As for natural gas production, total production increased to 4036.9 bcm in 2021 from 3861.5 bcm in 2020 that is a 4.8% increase. As evident in **Figure 1.4**, natural gas production almost doubles every 20 years. While natural gas production was around 2457.4 billion cubic meter (bcm) in 2001, it was 4036.8 bcm in 2021. Some decreasing patterns can be observed in the figure, but they were mainly as a result of unfortunate events that happened in specific intervals. For example, the 2008 financial crisis affected the economy negatively, so that ultimately led to a decrease in energy production. The same negative scenario occured in 2020 with the COVID-19 outbreak. Because countries locked down or shut down all activity related to industry, energy demand decreased compared to the previous year. A year after the pandemic, natural gas production began to increase and again followed the same pattern as in previous years.

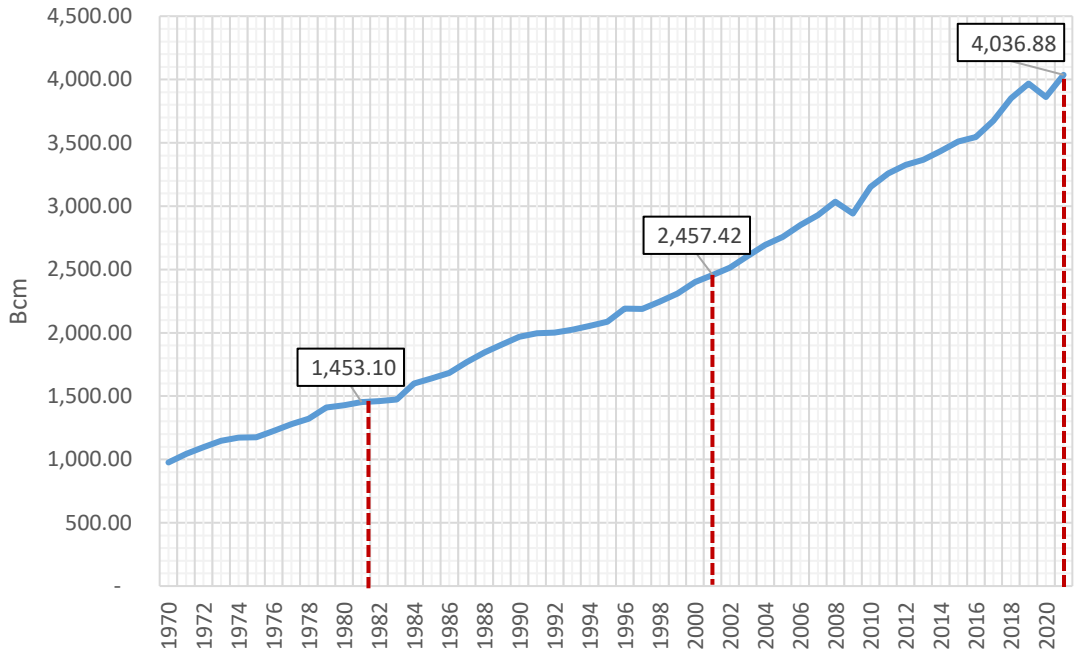


Figure 1. 4 Natural gas production in the world

Source: BP, 2022

The largest, top ten gas producers producing over 100 bcm are: the U.S., Russia, Iran, China, Qatar, Canada, Australia, Norway, Saudi Arabia and Algeria. These countries were responsible for 73% of total natural gas production in 2021 (**Figure 1.5**). In addition, there are other natural gas producing countries that represent 27% of global natural gas production. There are also some other countries that invest in the exploration of natural gas reserves.

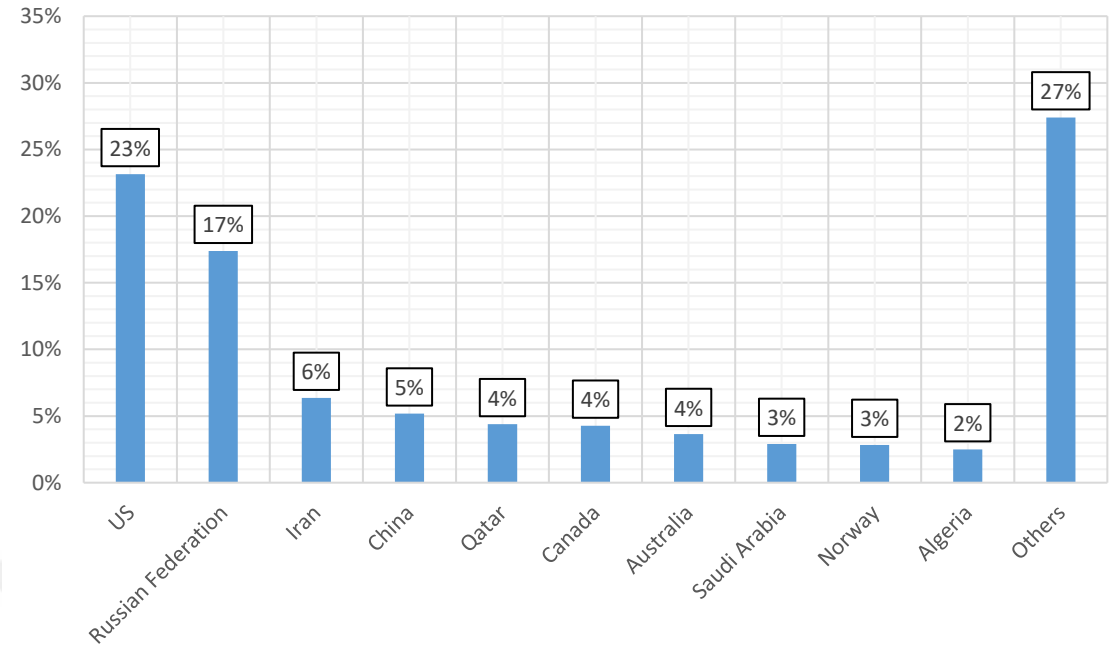


Figure 1. 5 Shares of natural gas production in the world

(Source: BP, 2022)

Alternatively, total global gas consumption reached 4037.5 bcm, a 5.3% annual increase compared to 2020. Similar to production, natural gas consumption almost doubles every 20 years. Since the capacity of the gas storage systems is limited the consumption is very close to production, for instance in 2021, 4036.88 bcm is produced while 4037.46 bcm is consumed. Total global gas consumption was 1439.59 bcm in 1982; it jumped to 2431.68 bcm; and finally reached 4037.46 bcm by the end of 2021. In 2021, the biggest natural gas consumer was the U.S. with 826.7 bcm. Russia came second by consuming 474.6 bcm. China was the third biggest gas consumer with 378.7 bcm and Iran was in fourth place with 241.1 bcm. In comparison, while the U.S. consumed 826.7 bcm of natural gas, the entire European continent consumed 571.1. The U.S. was responsible for 25% of the total global natural gas consumption.

In 2021, Asia Pacific and CIS coutries were responsible for consuming 112.15 bcm more natural gas compared to the previous year, a 58% annual increase in total natural gas consumption. Europe consumed 29.10 bcm of natural gas which comprised 14% of total natural gas consumption in 2021 (**Figure 1.6**). Although Europe has implemented a series of reforms to achieve carbon neutral goals, natural gas usage by the largest consumers

has not decreased. For example, Germany and Italy consumed 3.41 and 4.9 bcm more natural gas compared to the previous year, respectively. However, due to the Russian invasion of Ukraine in 2022, gas consumption in the European Union may be reduced in the coming years. For now, Russia has permanently cut gas supplies to Europe due to force majeure, and sabotage to the Nord Stream gas pipelin in November 2022 (Reuters, 2022). As a result, gas demand will affect the European Union and this will ultimately lead to a decrease in natural gas consumption since Europe imports roughly 151 bcm of natural gas from Russia. Replacing this amount of volume in the short term appears to be an impossible task.

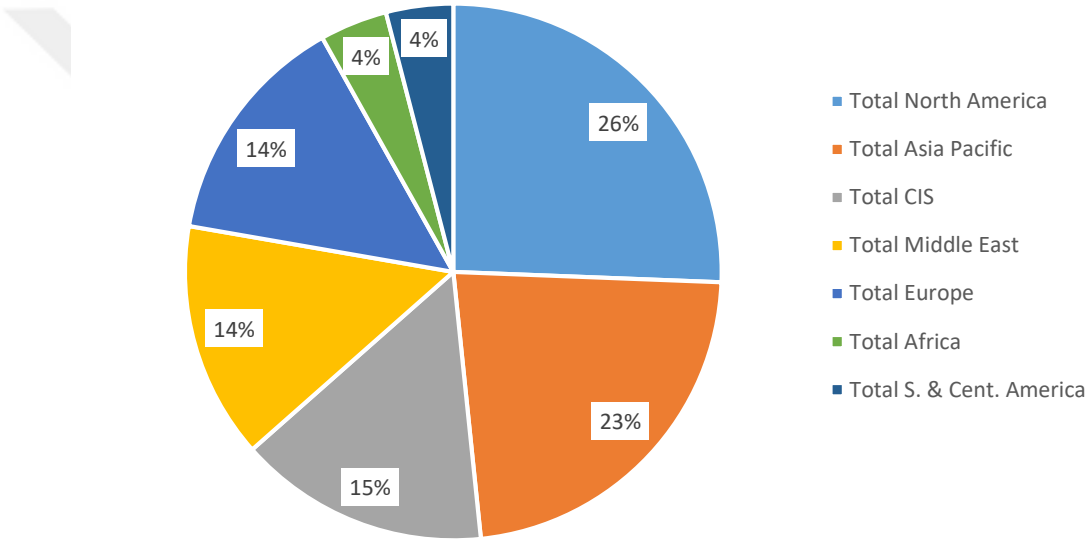


Figure 1. 6 The share of natural gas consumption by region

Source: BP, 2022

Looking ahead natural gas trade movements via pipeline, total natural gas export was realized as 704.4 bcm. Russia was the biggest natural gas exporting country with 201.7 bcm. While 132.3 bcm of these volume were imported by European Union member states, 34.7 bcm of which were imported by rest of the Europe countries (BP, 2022).

“For long distance transportation of natural gas, natural gas liquefaction has many advantages over pipeline transportation” (Kumar et al, 2011, p.4265). Therefore, LNG is an integral part of the world’s natural gas business since the liquefaction allows for the

transportation of gas to energy poor regions or where pipeline routes are hard to install or invest in. In addition to this, since flexibility is a key advantage of using LNG, buyers or importers generally prefer short-term contracts orspot LNG cargoes. In parallel with these distinctive advantages, the LNG market has also been developing and growing over the last 22 years (**Figure 1.7**). In 2021, global LNG imports increased from 490,1 bcm to 516.2 bcm, which is a 5,6% annual increase. Qatar and Australia are dominating the LNG market with 214.8 bcm exports, which was 42% of total LNG exports, but the U.S. share is also growing exponentially due to the shale revolution. With 95 bcm export volume in 2021, the U.S' export share jumped from 12.5% to 18.4% compared to the previous year. As for the LNG imports, total volume increased from 490.1 bcm to 516.2 bcm in 2021. While the European continent imported 8 bcm less LNG, Asian countries demand were 25.5 bcm more LNG.

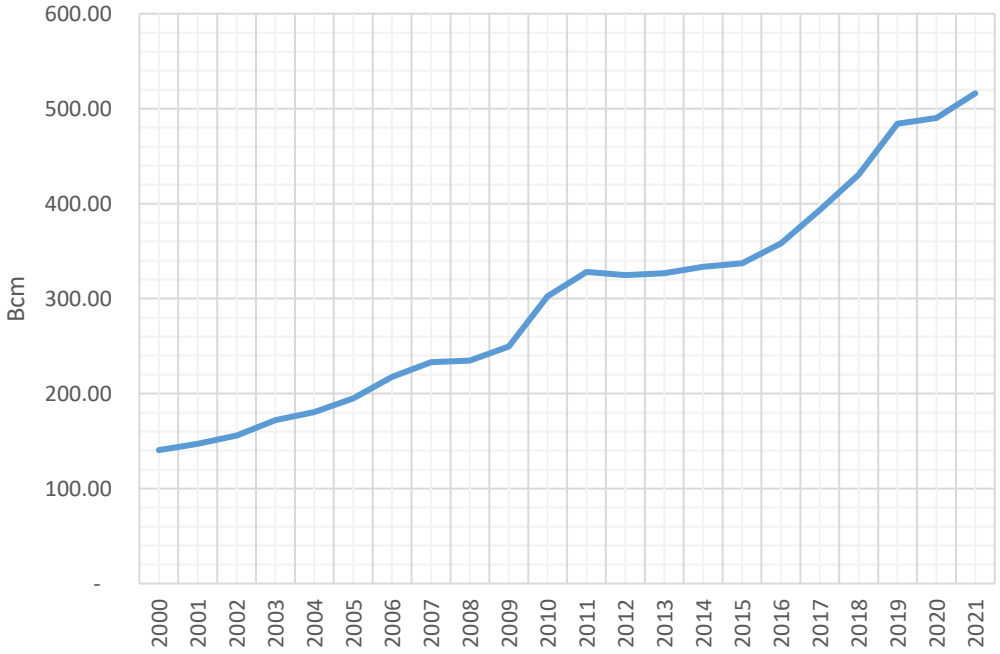


Figure 1. 7 The world LNG imports

Source: BP, 2022

2.3 Evolution of liberal natural gas markets in the world

No country in recent decades has achieved economic success, taking into account considerable increases in living standards for people living in those countries, without

opening its markets to the rest of the world (IMF, 2011). Some industries or services may need intensive government involvement at the beginning if the amount of money spent on the investment is substantial. For example, development, exploitation and operations, which includes transport, distribution and storage systems, are hard to understand and risky activities in the natural gas industry, and they require large capital investments (Aad, 2016). Therefore, states or governments are willing to pioneer expensive services or industries such as telecoms, banking and energy. After these industries and services reach maturity, it is time to switch from crawling to walking. This is important to be able to see a return on the investment. On the other hand, the quality and reliability of services can be improved when internationally successful firms enter the market as a result of privatization (Jens et al, 2006). For this reason, private initiative should be a part of big services and industries to make all services more affordable, efficient and fair for end users. Although privatization seems to be a fundamental, it is not the only sufficient step to bring the positive outcomes of competition to the market (Newbery, 2006).

Since the monopolistic power can be transferred from state-owned companies to private ones, regulation is an integral part of opening the market to competition. The aim of liberalization is to promote efficiency and lower prices for consumers by introducing competition into markets which have traditionally been monopolized either nationally or regionally (Stern, 2018). The liberalization process in different industries was firstly observed in the United States at the end of 1970s and in the United Kingdom at the beginning of the 1980s, and became a priority for the European Commission at the end of the 1980s (Daniel, 2006). In parallel with liberalization reforms in the West, Asian countries followed the same policies in different services and industries. For example, the privatization of telecommunication services took place in the 1980s in South Korea and reform efforts for market liberalization in India started in the 1980s (Singh, 2000).

2.3.1 Starting of liberalization in the USA

The U.S. was the first country to open interstate pipeline access to third parties and unbundled activities related to transport/sales, and expanded liberalization stage by stage in different states (IEEJ, 2002). Following a series of natural gas policies (e.g., the Natural

Gas Policy Act of 1978), the U.S. natural gas market has deregulated and transformed rapidly between the 1980s and 1990s. Today the U.S. natural gas sector is mainly organized by private companies which are responsible for upstream operations, transmission, storage and downstream deliveries. (Jena-Michel et al, 2013). In addition to this, policy reforms paved the way to create the world's most competitive, transparent and liquid gas hub, Henry Hub.

2.3.2 First liberalization in Europe: the UK experience

After the natural gas market liberalization in the U.S, the first liberalized natural gas market in Europe was Great Britain. Although the Gas Act, which was passed in 1986, was the first move to create a liberalized gas market, the Gas Act enacted in 1995 was the most important step on the way to a fully liberalized gas market (Patrick, 2010). On the other hand, the liberalization process in Britain is divided into three stages (**Table 1.1**) by Dominique and Locatelli (2007). The first stage was the evolution of regulatory framework, choosing gas suppliers other than a state-owned company and the creation of an independent regulator between the years 1982 and 1993. In the following stage, the separation process from state-owned companies continued with gas release programmes implemented during 1994 and 1999. In the third stage, legal and institutional separation of both transportation and trade activities were initiated, a network code was adopted and the focus was on establishing a spot market. After demolition of state incumbent British Gas, the state-owned company market share decreased gradually, the market was opened to competition and a huge amount of natural gas was imported into Great Britain from multiple locations. At the center of this revolution, National Balancing Point (NPB) was created as the first natural gas hub in Europe in 1996.

Table 1. 1 The stages of the British experience

1st stage, 1982-1993	2nd stage, 1994-1999	3rd stage, 1997-2002
-Third-party access	-Market opening continued	-Legal and institutional separation in both transport and trade activities
-Consumer can choose their supplier	-Introduction of competition	-Creation of NBP
-Creation of independent regulator	-Gas release programmes	-Adoption of Network Code

Source: Dominique & Locatelli (2002)

2.3.3 Liberalization in the European countries

In pursuit of setting up fair, competitive and liquid energy markets where both supply and demand sidestake advantage of effective services, the European Union (EU) adapted several energy packages which included directives and regulations, aimed at opening up the EU's energy markets to competition (Slabá, 2009). These packages might be considered as cornerstones of the liberal gas and electricity markets in the member states. The First Energy Package was the first move towards the liberalization of the electricity and natural gas markets. The package adopted in 1996, which included the first Electricity Directive 96/92/EC and the first gas Directive 98/30/EC (EC, 1998), sets out key provisions on the way to liberalized gas markets. The Gas Directive required Member States to transform both the regulation and organization of their internal gas markets by granting rights to consumers to decide the gas supplier of their choice (Aad et al, 2003). Seven years later, The Second Energy Package, including the Second Gas Directive 2003/55/EC, was adopted in 2003,with some of the provisions entering into force in 2007. The package contained two directives and one regulation. The directives were the Second Electricity Directive 2003/54/EC and the second Gas Directive 2003/55/EC. In addition to these directives, one Regulation (EC) No 1228/2003 was adopted. The package brought more ambitiuous targets to speed up the liberalization of the internal energy markets and also enabled industrial and domestic consumers to choose their own gas and electricity suppliers for the first time. The Third Energy Package, included the Gas Directive 2009/73/EC, came 6 years later and was adopted in 2009. With the third package, the EU aimed to further liberalize both the internal electricity and the gas markets, and amended the previous package (European Parliament, 2021). In particular, the third package paved

the way for the independence of systems operators and facilitated the creation of new bodies for regulatory purposes. The package contained two directives and three regulations. The directives are the Electricity Directive 2009/72/EC and the Gas Directive 2009/73/EC. As for the three regulations, these are the Regulation (EC) No 713/2009, aimed at establishing an agency for the cooperation of energy regulators, the Regulation (EC) No 714/2009 aimed at deciding conditions for access to the network for cross-border exchange and the Regulation (EC) No 715/2009which decided on conditions for accessto the gas transmission networks.

The Third Package was one of the most important packages and strengthened the liberalisation process. Most importantly, the European Networks for Transmission System Operators (i.e., ENTSO) and Network Codes (i.e., NGs) for both the electricity (i.e., ENTSO-E) and the natural gas sectors (i.e., ENTSO-G) were established under the umbrealla of this package.

These three energy packages laid down key provisions for the liberalization of the gas markets (**Table 1.2**).

Table 1. 2 European Union's energy packages

Packages	Directives and Regulations
The First Energy Package	The first Electricity Directive 96/92/EC The first Gas Directive 98/30/EC The second Electricity Directive 2003/54/EC
The Second Energy Package	The second Gas Directive 2003/55/EC Regulation (EC) No 1228/2003
The Third Energy Package	The Electricity Directive 2009/72/EC The Gas Directive 2009/73/EC Regulation (EC) No 713/2009 Regulation (EC) No 714/2009 Regulation (EC) No 715/2009

Source: European Union, 2020

In light of the EU' liberal market objectives, the Dutch government responded to these changes quickly and pushed ahead to transform the EU's legislative and regulative

provisions into its own energy law. These fundamental changes were facilitated to build up a virtual trading platform, the Title Transfer Facility (TTF), launched in 2003 by Gasunie Transport Services B.V (GTS). Effective implementation of the liberal gas market strategy has made the Dutch TTF a benchmark gas hub in terms of price indication across Europe. For example, the TTF has not only become the pricing benchmark for northwest Europe, but it is also used to price LNG cargoes delivered to Europe (Patrick, 2020).

As for the rest of the Europe, the development of a fully liberalized natural gas market has been partially achieved in the most of the European states. According to Patrick's (2021) study, while some of member countriessuch as Italy, Germany and Austria, are categorized as active gas market in terms of traded volumes and other parameters other member countries like France, Spain, Belgium and Czech Republic are categorized as poor hubs. In addition to this, the remaining gas hubs in Europe are classified as inactive in the study. On the other hand, European countries have diversified their portfolios with short-term gas contracts. For example, as it can be clearly seen from **Table 1.3**, the number of long-term contracts and their durations have decreased over the years.

Table 1. 3 Long-term gas supply contracts in Europe

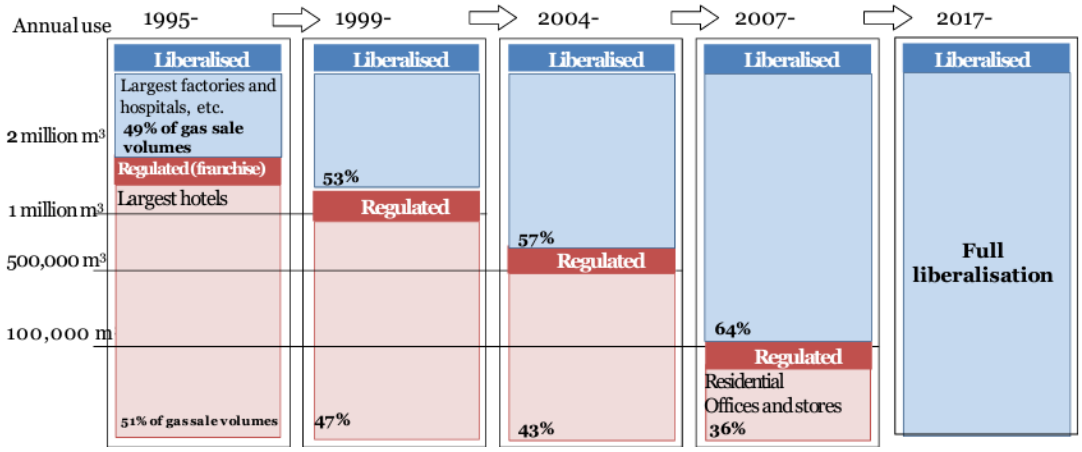
	Before 1990	**1991–2007**	**2008–2014**	**2015–2018**
Number of contracts	31	121	28	18
Total ACQ[a], (bcm/y) [b]	109	292	98	54
Average contract duration, years	23	18	15	14
Share of pipeline contracts	68%	53%	50%	22%
EU average gas consumption, bcm/y	345[c]	440	472	444
Share of total ACQ in consumption	32%	66%	21%	12%

[a]ACQ annual contract quantity
[b]Billion cubic meters in a year
[c]1990 consumption
Source: Chi (2019)

2.3.4 Situation in rest of the world

In Asia, market development and dynamics are very complex and different from Europe and the rest of the world. Since most east Asian countries, such as Japan, Korea and

Singapore, do not have domestic gas production, they are heavily dependent on more LNG supply. This situation creates insufficient liquidity and also causes lack of gas on gas competition in the gas markets (Shi, 2016). Therefore, dependence on seaborne trade can be seen as a main barrier for effective market implementation because LNG is a transportation sensitive product. Any interruption of gas supply due to any reason (e.g., weather) may lead to supply shortages and price volatility. However, some countries have been trying to liberalize their internal energy markets in Asia. China has made great progress in liberalization of the gas market by implementing price deregulation, unbundling infrastructure and allowing third-party access (IEA, 2019). However, the effective natural gas market in China has as of now not yet been effectively implemented compared to the international gas market due to strict price controls on residential gas (Chai. et all., 2019). On the other hand, even though liberalization was fully implemented in 2017 in Japan, consolidation of big state incumbents has created uncertainty on whether policies and reforms will be successful (NBR, 2019). In addition, the process of liberalisation of the city-gas industry in Japan can been clearly seen in **Figure 1.8**.



Note: 1 Regulated prices have been maintained in certain areas where effective competition may not be expected to protect consumers as a transitional measure.

2 Shares are based on sale volumes of the 10 biggest incumbent city- gas companies.

Figure 1. 8 A brief history of city-gas liberalisation

Source: Hiroshi (2019)

2.3.5 Natural gas trading

Today natural gas is traded in the gas markets either as a physical or financial commodity. But there are various of terminologies of hubs in the literature such as physical hubs, exhanges, virtual hubs, and financial hubs (Xunpeng and Variam, 2018). Therefore, it is crucial to be able to make a differences between types of hubs and types of markets at hubs (IENE, 2014).

Physical hub is defined as an transit location (i.e., physical point) where natural gas is delivered and traded physically. In this type of hub, several pipelines come together and gas is delivered via inter-connected pipelines at specific entry or exit points. On the other hand, a virtual hub allows market participants to trade natural gas as a financial commodity and financial transactions on a trading platform. Virtual hubs are generally referred to internal-market activities or transactions made on regional zones. Participants are usually benefit from virtual hubs for balancing their portfolios on daily basis. In addition, the virtual hubs allows to market participants to optimize their business objectives (e.g., optimize portfolio) and reduce short-term or long-term risks.

Regarding with importance of natural gas hubs, spot markets, gas excanges and other financial gas markets develops around the gas hubs. This ultimately contributes to lower prices because of competition in the market, liquidity, and supply security.

3. NATURAL GAS MARKET IN TÜRKİYE

In this part, natural gas market reforms in Türkiye is investigated. All statistics and data related to this chapter are based on data provided by EMRA, BOTAŞ and other reliable institutions. This section also provides a general overview of Türkiye's internal gas market, and gas market reforms in order to explain the general characteristics of the Turkish natural gas market.

3.1 Türkiye’s energy outlook

In parallel with growing energy demand, Turkiye’s energy consumption has been growing as a consequence of its young population and developing industrial activities with approximately 6,83 exajoules in 2021 (BP, 2022). As it can be clearly observed from **Figure 2.1**, 83% of its energy consumption was supplied by fossil fuels in 2021. While the share of coal and oil are approximately the same, the share of natural gas in the energy mix is higher than the other sources.

Natural gas was used for the first time in Türkiye for residential heating and commercial purposes in 1987 (Erdogdu, 2009; Çelebi et al., 2013). Since environmental pollution reached critical levels in Ankara because of excessive use of coal for heating purposes, widespread use of natural gas was introduced in Ankara in 1988 as an alternative to coal. After air pollution decreased due to the replacement of coal with natural gas, gas was in demand in other provinces such as İstanbul in 1992, Bursa and Eskişehir in 1996.

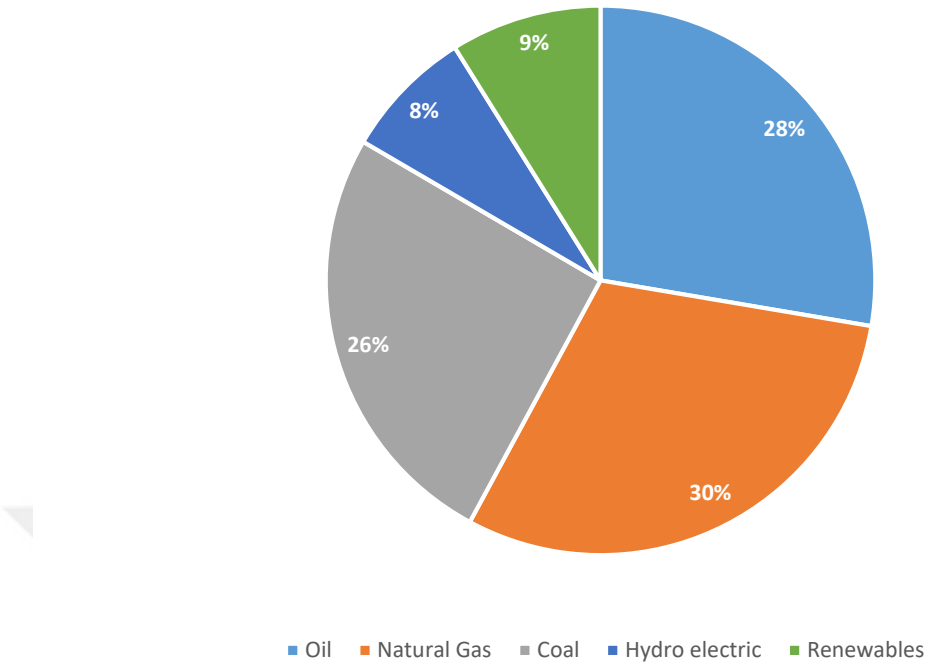


Figure 2. 1 Primary energy consumption by fuel in Türkiye

Source: BP, 2022

Turkiye has strived greatly to increase domestic energy production by investing in renewables and domestic fossil energy sources such as coal. The share of renewables consumed in the energy mix was recorded as 17% including both hydros and other renewables. In order to decrease energy imports and enhance supply security, Türkiye has implemented several energy policies to speed up energy production domestically. Local energy sources are mainly driven by renewables such as hydro, geothermal, wind and solar and lignite. "*Turkey's electricity share of final energy demand is set to increase, driven by strong fundamentals encompassing macro-economic and social development objectives, ongoing industrialization and urbanization trends*" (IICEC, 2020). Therefore, electricity generation increased from 306,7 TWh to 333,3 TWh in 2021 (**Figure 2.2**).

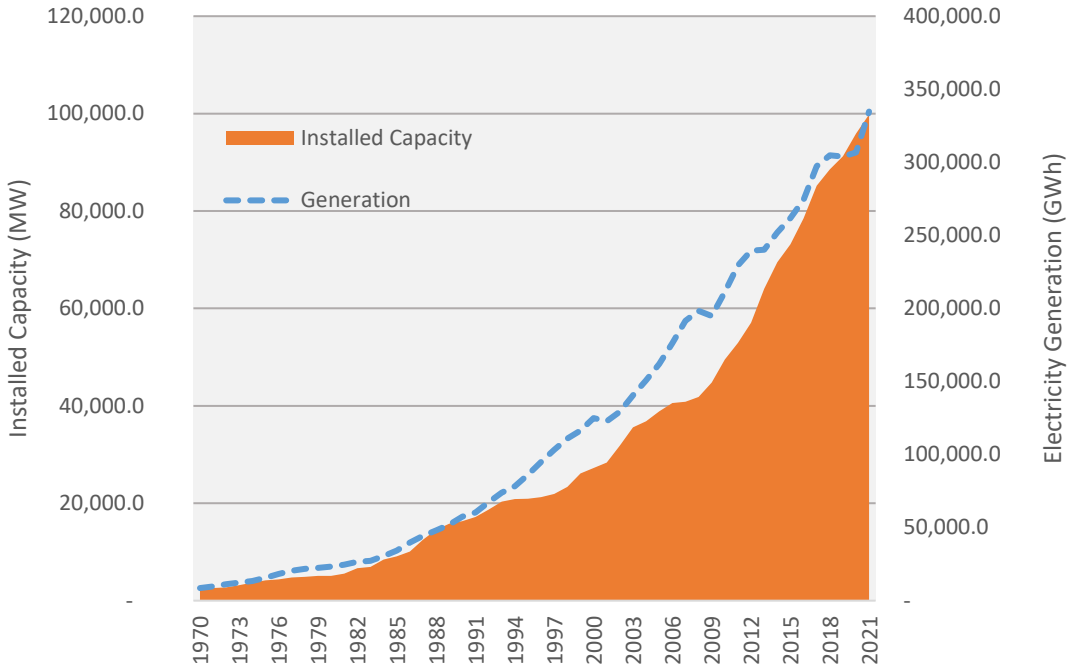


Figure 2. 2 Installed capacity and electricity generation

Source: TEİAŞ

Looking at electricity generation by fuel type, the biggest increase observed in electricity generation is in natural gas with a 39,46 TWh increase in 2020 compared to the previous year. As it can be clearly seen from the **Figure 2.3**, since the amount of energy generated from hydros decreased from 78,09 TWh to 55.66 TWh in 2021, the gap in the energy mix was replaced by natural gas. In parallel with increasing consumption of gas, Türkiye imported 10.51 bcm more natural gas in 2021. When Türkiye's demand for natural gas was 48.49 bcm in 2020, it was 59.02 by the end of 2022. It is possible that since the world has been faced with unprecedent challenges such as droughts, the amount of energy generated from hydroelectric power plants reduced because water volumes hit very low levels. Therefore, Türkiye's energy generation from hydros reduced in 2021, triggering an increase in the amount of electricity generated from gas.

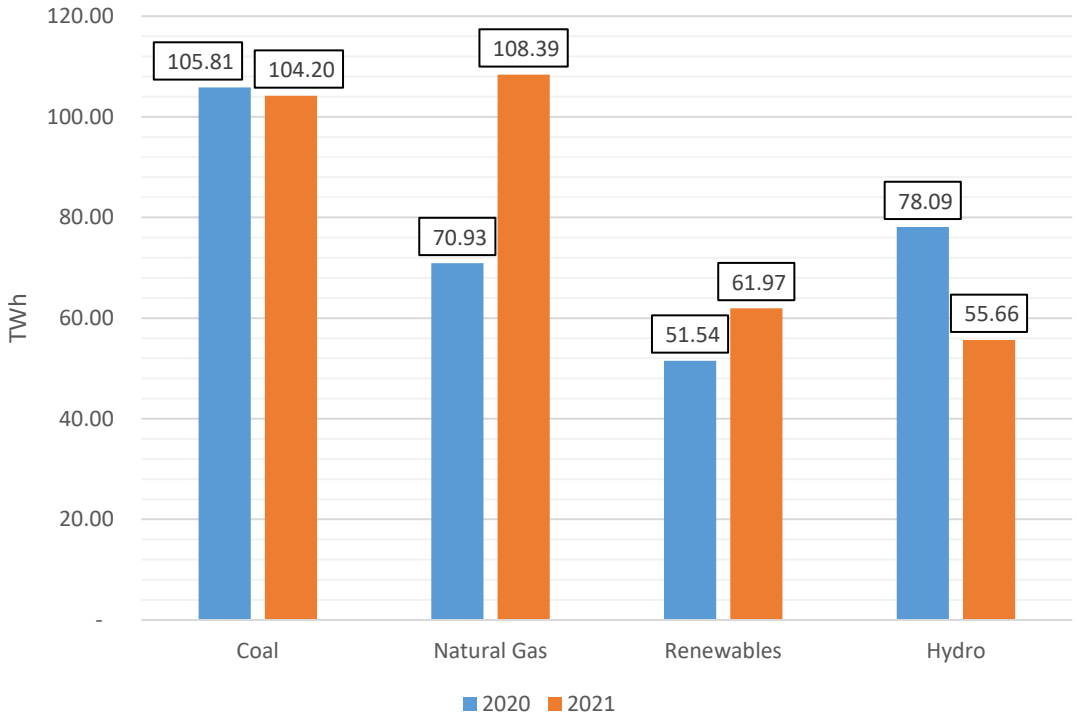


Figure 2. 3 Electricity generation by source

Source: TEİAŞ

3.2. Overview of the internal gas market

Natural gas is one of the important energy sources for electricity generation in Türkiye. In accordance with this importance, Turkey has been steadily increasing supply security with different natural gas projects. TurkStream, the Trans-Anatolian Natural Gas Pipeline Project (TANAP), which is also considered the backbone of the Southern Gas Corridor (SGC), Liqiefied Natural Gas (LNG) terminals, Floating Storage Regasification Units (FSRU), and expanding the capacity of underground storage facilities (e.g., Salt Lake) are some of the projects being developed for the diversification of the natural gas supply. In line with these steps, the natural gas network and its infrastructure are constantly being developed.

The length of domestic gas distribution pipelines is inreasing rapidly. By the end of 2021, the length of polyethylene pipeline reached 108.600 km and the steel pipeline has reached 15.702 km (**Table 1.4**).

Table 1. 4 Lengths of polyethylene and steel pipelines, and service line

Length of Distribution Network				
Year	Polyethylene (km)	Steel (km)	Service Line (km)	Total (km)
2006	20,000.00	2,600.00	-	22,600.00
2007	38,000.00	3,900.00	-	41,900.00
2008	42,000.00	4,500.00	-	46,500.00
2009	45,000.00	5,100.00	-	50,100.00
2010	54,000.00	7,200.00	-	61,200.00
2011	56,200.00	7,400.00	-	63,600.00
2012	58,600.00	8,100.00	-	66,700.00
2013	59,650.17	9,048.61	23,063.10	91,761.88
2014	63,967.87	9,486.37	25,160.90	98,615.14
2015	68,451.56	10,181.52	27,424.79	106,057.87
2016	74,632.34	11,074.89	29,796.63	115,503.86
2017	81,478.17	12,326.19	33,022.54	126,826.89
2018	90,139.51	13,486.49	35,941.62	139,567.62
2019	95,179.90	14,148.86	37,920.51	147,249.27
2020	101,495.76	14,924.18	40,748.05	157,167.99
2021	108,616.80	15,702.35	43,292.37	167,611.51

Source: EMRA, 2022

As a consequence of the infrastructure development, daily maximum send-out capacity went up to approximately 400.0 million cubic meters per day (mcm/day), while daily natural gas demand is nearly 300.000 mcm. **Figure 2.4** clearly shows how the pyhsical infrastructure of the Turkish gas network has been improved over the years. These developments are considered as a key invesment in Türkiye's energy security, especially during peak demand seasons.

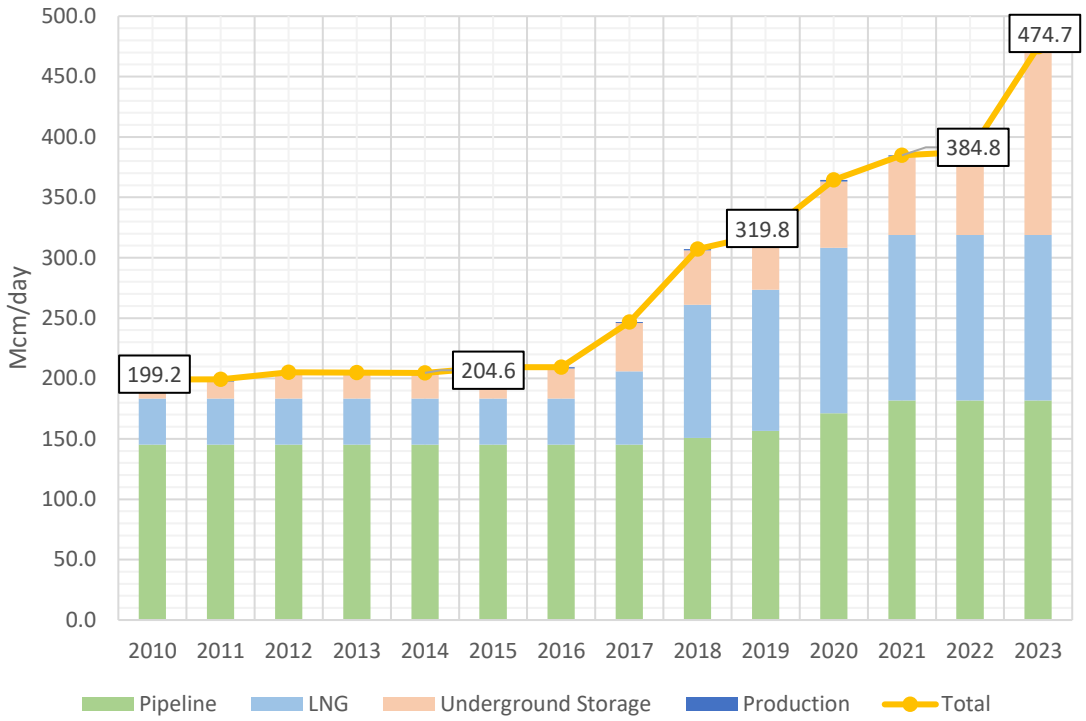


Figure 2. 4 Daily capacities at the entry points

Source: BOTAŞ

With the development of natural gas infrastructure and other energy investments, Türkiye not only ensures its own energy security, but also contributes to that of their neighbours. For example, 17.29 bcm natural gas was delivered to the European section of Southern Gas Corridor (i.e., TAP) via TANAP by the 24th of October 2022 (TAP, 2022). However, even if the country has a well-established physical network for the movement of gas, reforms and policies are needed to ensure the security of the gas supply in the long-term. In this regard, Europe can be taken as a role model for Türkiye with respect to the reforms and policies needed for a well-functioning energy market, governance, and supply security.

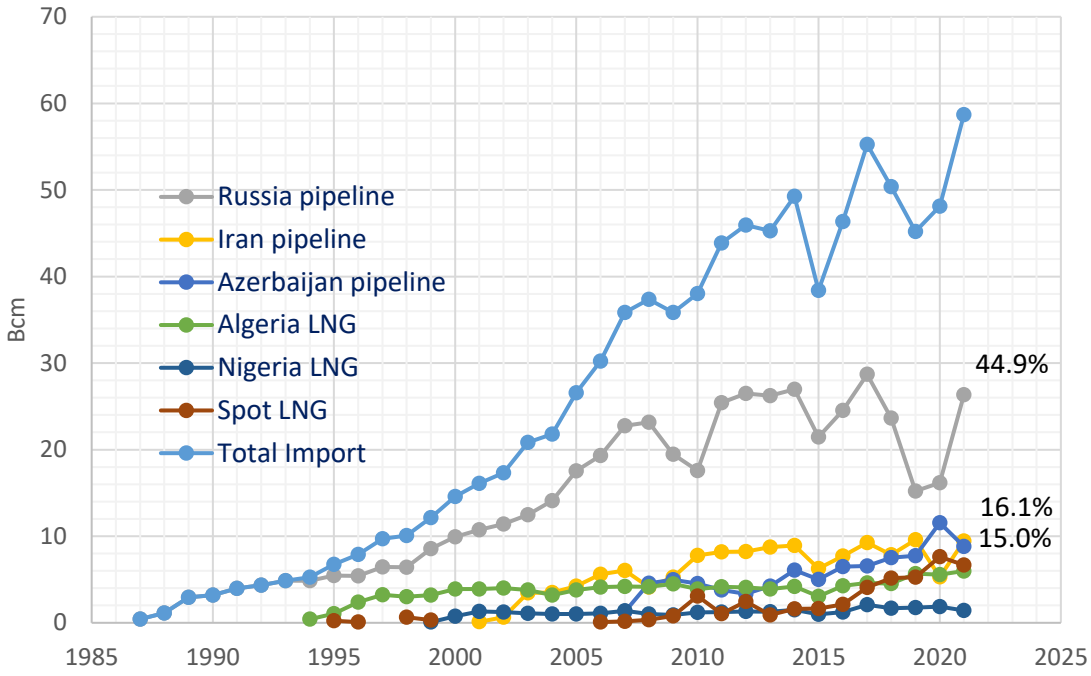


Figure 2. 5 Natural gas import by country

Source: EMRA Annual Natural Gas Reports and DEIK

Russia is the largest gas supplier to Türkiye and several pipelines have been built to send gas from Russia to Türkiye (**Figure 2.5**). In 1986, Turkey started to receive gas from the West Line (i.e., Malkoçlar Entry Point) within the scope of long-term supply contracts. As a consequence of Türkiye's growing natural gas demand, Türkiye and Russia signed several contracts to export more Russian gas to Türkiye via new pipelines. The second big project with Russia was Bluestream, which started its commercial operations in 2003. Because of Türkiye's growing demand for gas has continued over the years, the establishment of the Turkstream pipeline was initiated under the scope of an intergovernmental agreement between Türkiye and Russia. With the first commercial flow via Turkstream in 2020, the West Line pipeline came to and end, and this pipeline has not been used since the beginning of 2020. Therefore, contracts signed with Gazprom for receiving gas at the Malkoçlar Entry point transferred to the Turkstream pipeline (i.e. Kıyıköy Entry Point). Also, there are some opportunuties for cross-border trade to deliver natural gas via the West Line with reverse flow to Europe. Indeed, 45% of Turkiye's natural gas imports were delivered via the Turkstream and Bluestream pipelines in 2021. As part of the diversification strategy, Türkiye aimed to diversify natural gas supply routes with different projects. In accordance with this need, Türkiye started to import gas

from Iran at the Gürbulak Entry Point in 2001. Although Türkiye has experienced some complications (e.g., capacity restrictions and force majeure) with the gas supply from Iran, the amount of gas imported via this pipeline has contributed to Türkiye' supply security. In 2007, Türkiye signed an agreement to import Azerbaijani gas via the Turkgözü Entry Point. In the ensuing years, Türkiye and Azerbaijan strengthened their cooperation in the field of energy and these mutual efforts gave birth to the Southern Gas Corridor project which aims to deliver gas resources from the Caspian Sea to the natural gas market in Europe. According to SGC*"The Southern Gas Corridor comprises the following four projects: (i) Shah Deniz natural gas-condensate field ("SD1") and its full-field development ("SD2"), (ii) South Caucasus Pipeline ("SCP") and its expansion ("SCPX" project), (iii) Trans-Anatolian Natural Gas Pipeline ("TANAP") and (iv) Trans Adriatic Pipeline ("TAP") (SD2, SCPX, TANAP and TAP collectively, the "Projects"). Upon completion, SD2 project added a further 16 bcma of natural gas production capacity to 11 bcma production capacity already existing under SD1 project. Total length of the newly constructed SCPX, TANAP and TAP pipelines is more than 3,200 kilometres."* Currently, the project has the capacity to deliver 6 bcm of gas to Türkiye and 10 bcm to Europe, but TANAP's capacity is defined in the Intergovernmental Agreement stipulating that 32 bcm or more than 32 bcm gas can be transporterd per year in cooperation with Türkiye (TANAP). In 2018, TANAP connected to the Turkish transmission system and the first gas flows to Türkiye were initiated via this pipeline. In addition, 17.29 bcm of gas was delivered to Europe via the Trans Adriatic Pipeline (TAP) between the 31st of December 2020 and 25th of October 2022 (TAP EDP). Since depending heavily on importation via pipeline may increase supply disruptions, Türkiye has also increased LNG capacity and the number of terminals to be able to mitigate or avoid potential supply shortages via pipeline. Marmara Ereğlisi LNG Terminal, which has been owned and operated by BOTAŞ since 1994, was the first LNG terminal in Türkiye. The second LNG terminal was İzmir Aliağa LNG Terminal, which is owned and operated by EgeGaz, began its operations in 2006. These two terminals have the capacity to supply 77.0 mcm gas to the national grid and also have the ability to store around 0.54 m3 liquid gas. In addition to the LNG terminals, FSRUs are also another important component of Türkiye's diversification strategy. Currently, there are two FSRU terminals in operation now. Etki Liman FSRU, in operation since 2017, is the first

one which has a daily regasification capacity of 28,00 mcm and can also store 0,17 m3 liquid gas. The second FSRU Terminal is Dörtyol, which is located in southern Türkiye with the same regasification and storage capacity as Etki Liman FSRU. Dörtyol FSRU has been operated by BOTAŞ since 2018. The last FSRU project will be located in Saros and is scheduled to be operational by 2023. The project will contribute a daily send-out capacity between 20.0 and 30.0 mcm. With offsore and onshore LNG projects, Türkiye has already diversified its supply routes and increased the total daily send-out capacity. Regarding seasonal fluctuations on gas demand, Türkiye has also invested in underground storage facilities for natural gas. Both the Silivri and Tuzgölü underground storage facilities have a 48.0 mcm withdrawl capacity that can be delivered to the national grid in case of any gas shortages or for balancing purposes. Moreover, there are several projects being carried out by BOTAŞ to increase the underground storage facilities as well. For example, The Silivri expansion aims to increase total storage capacity from 3.20 bcm to 4.60 bcm and increase withdrawal capacity from 28.0 mcm to 75.0 mcm by the end of this year. Tuz Gölü is an another storage facility that BOTAŞ is plannig to expand, increasing its capacity from 1.0 bcm to 5.40 bcm by 2023.

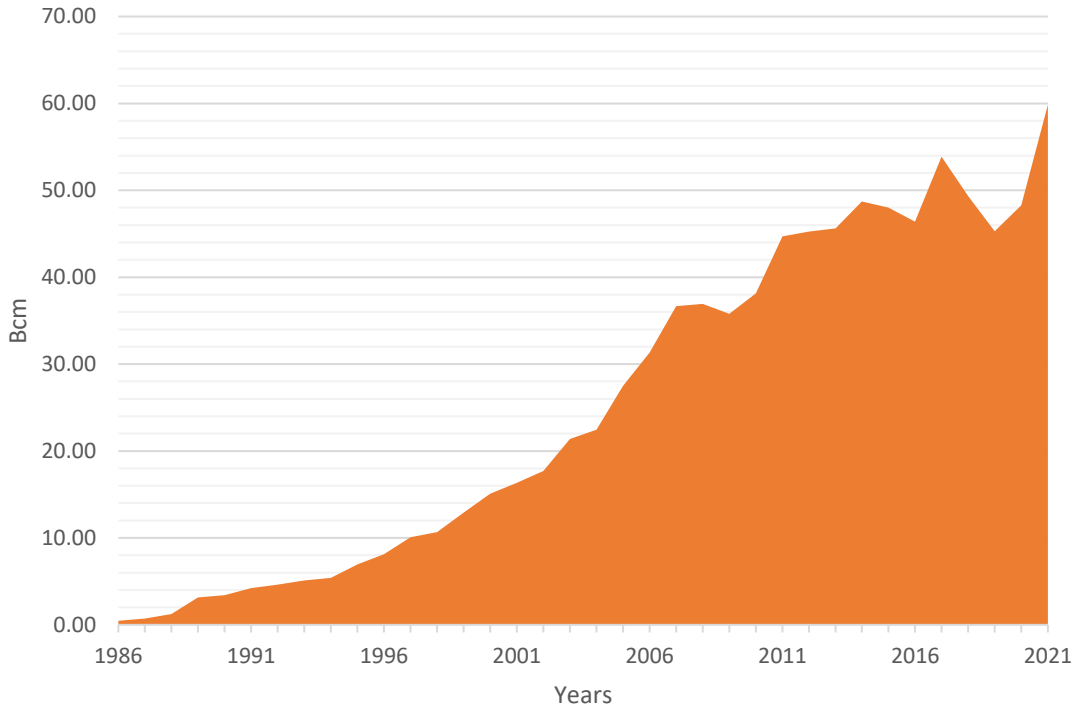


Figure 2. 6 Natural gas consumption in Türkiye

Source: BP, 2021

On the production side, Türkiye is producing a very small amount compared to its natural gas demand(**Figure 2.6)**. Therefore, 99% of natural gas is being imported into Türkiye from different exporter countries. However, Türkiye has discovered approximately 540 bcm natural gas during exploratory drilling activities in the Black Sea. Government authorities point out that the first gas flow will occur in 2023. In the first phase of the project, 10.0 mcm gas will be exploited and contribute to reduced costs in energy import. With the second phase of the project, production is expected to increase to 40.0 mcm, which is almost equal to the amount of gas imported via the Turkstream pipeline.

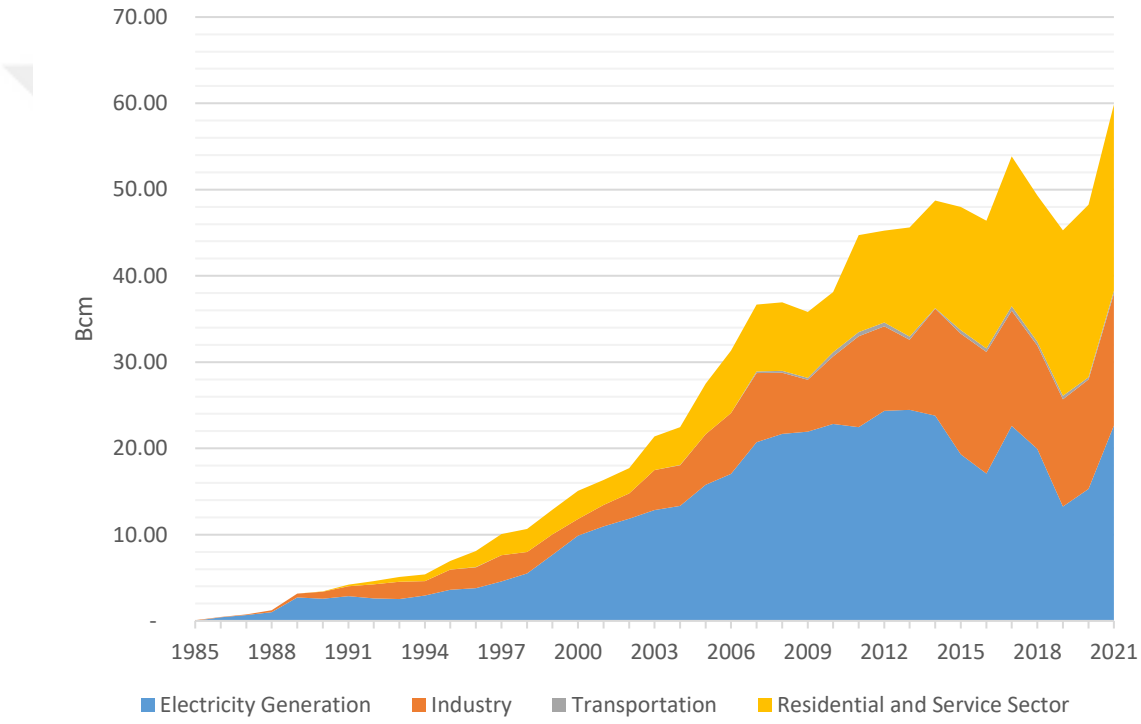


Figure 2. 7 Natural gas consumption by sectors

Source: DEIK

In Türkiye, natural gas is generally used for electricity generation and residential heating purposes. As it can be clearly seen from **Figure 2.7**, the majority of consumption is for electricity generation purposes. In addition to this, since Türkiye has been continuosly developing its natural gas distribution network over the years, residential usage has increased. According to data provided by EMRA, 81 provinces and 594 districts in Türkiye have access to natural gas with 17.885.750 subscribers and 667.953 eligible

consumers as of the end of 2021 (EMRA, 2021). **Figure 2.8** clearly shows that the majority of subscribers are non-eligible consumers.

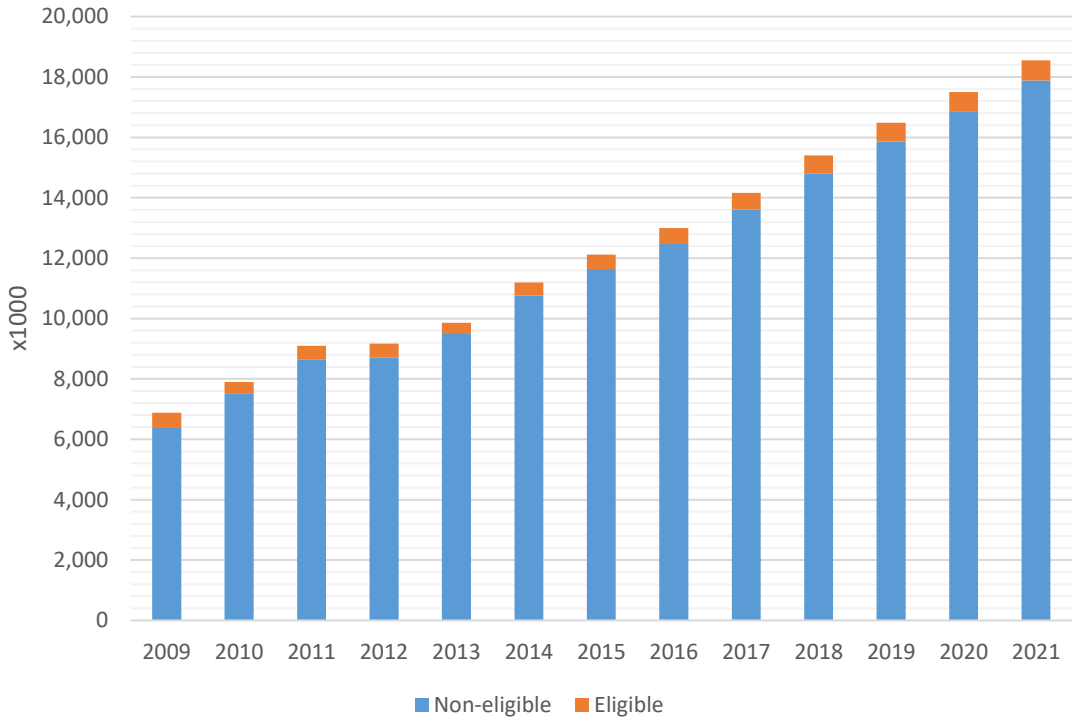


Figure 2. 8 Number of subscribers

Source: EMRA

The Turkish economy has struggled over the last three years. Political tensions inside and outside of the country have led to economic contraction and a lower growth rate. In parallel with this economic uncertainty, natural gas consumption has decreased since 2017. There is a positive correlation between the gas demand growth rate and the GDP growth rate between 2004 and 2021 (**Figure 2.9**). Therefore, if economic activities will not rebound in the future, the demand for natural gas will likely be lower than previous years. In addition to this, Turkey may replace natural gas with the use of domestic coal resources. Because the world has struggled with the unprecedented coronavirus outbreak, energy prices fell considerably during 2020. Moreover, since Türkiye's water reserves were at low levels, the country did not generate significant electricity from hydroelectric power plants. Therefore, Türkiye's energy gap replaced with higher gas consumption to fill the gap in the energy mix compared to previous years.

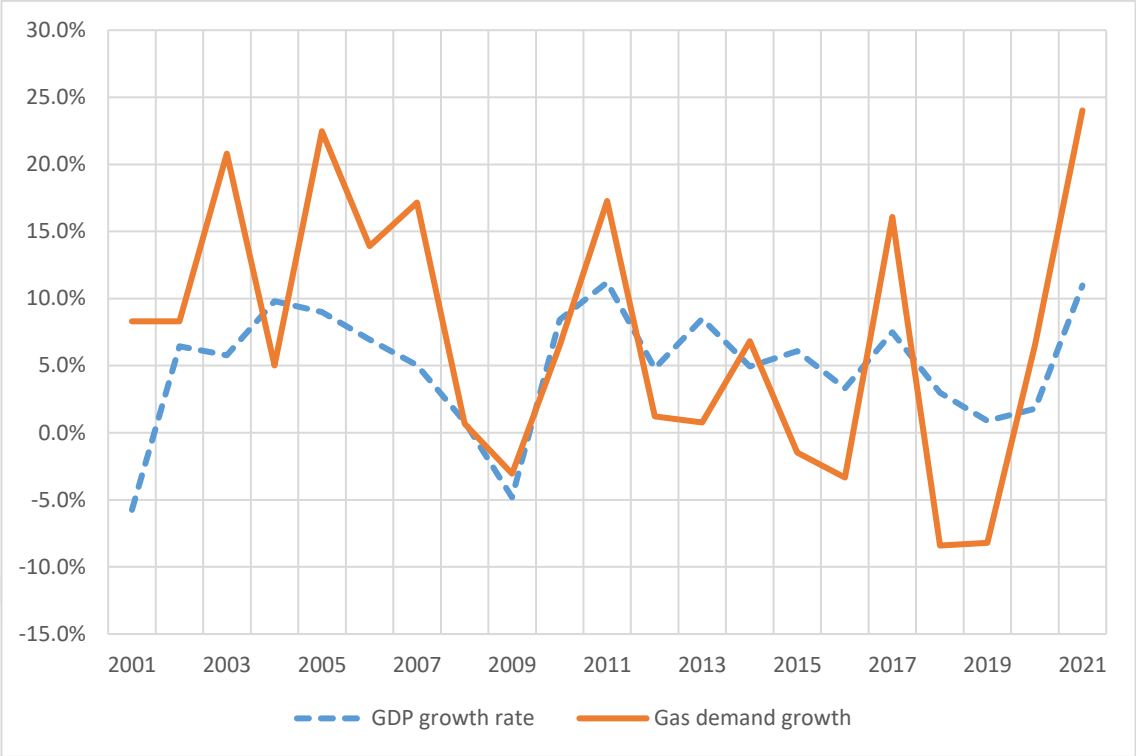


Figure 2. 9 GDP growth versus gas demand growth

Source: IMF & EMRA

3.3. Gas market reforms in Türkiye

According to Pollitt (2012, pp.128-137), "*The European Union implemented a series of reform directives in 1996, 2003 and 2009 aimed at completing a European single market in electricity and gas via the vertical unbundling of activities and the opening up of retail and wholesale markets to competition*". Almost 20 years ago, Türkiye also started the liberalization process iaccording to the basic concepts of the European reform directives. In line with this step, the Natural Gas Market Law No. 4646 (hereafter referred to as the Law) entered into effect in 2001 (Çetin et al., 2014). With the Law, the Turkish government aimed to establish a liberalised natural gas market by unbundling state-owned company control to promote a free market and to allow private companies access to transmission systems while still protecting end users from unfair prices. Moreover, under the Law, an individual market player's share cannot exceed 20% of total market volume and BOTAŞ cannot enter intro new natural gas contracts/agreements until BOTAŞ's market share decreases to 20%. Although the Law was enacted in 2001, most of the goals in the law have not been met, yet. According to the Law, BOTAŞ's import

share should be decreased to 20% and must transfer its own import share to private companies. However, today, 96% of total gas consumption is supplied by the state-owned gas company. Therefore, BOTAŞ' role in the gas market makes the connection between diversification and competition weaker (Çetin & Oğuz, 2007). At the end of 2012, BOTAŞ handed over some of its contracts signed with Russia to private companies (**Table 1.5**).

Table 1. 5 Long-term and spot natural gas contracts in Türkiye

Company	Signature Date	Length	Volume (bcm/year)	End of Contracts
Gazprom Export, Russia	1997	25	16.00	2028
NIGC, Iran	1996	25	10.00	2026
SOCAR, Azerbaijan (Phase II)	2012	25	6.00	2043
SOCAR, Azerbaijan (BTC)	2021	3	11.00	2024
Gazprom Export, Russia*	2013	30	2.25	2043
Gazprom Export, Russia*	2013	30	1.00	2043
Gazprom Export, Russia*	2013	30	1.75	2043
Gazprom Export, Russia*	2013	30	1.00	2043
Gazprom Export, Russia	1998	23	5.75	2025
Gazprom Export, Russia**	1998	23	0.25	2021
Gazprom Export, Russia**	1998	23	2.50	2021
Gazprom Export, Russia**	1998	23	0.75	2021
Gazprom Export, Russia**	1998	23	0.50	2021
Gazprom Export, Russia	1998	23	4.00	2021
Soyuzgasexport, Russia (SSCB)	1984	25	6.00	2012
Nigeria LNG, Nigeria	1995	22	1.20	2021
Sonatrach, Algeria	1988	27	4.00	2021
SOCAR, Azerbaijan (Phase I)	2001	15	6.60	2021

**Contracts (Valid) transferred from BOTAŞ to Akfel, Batıhattı, Kibar, and Bosphorus Gaz*

***Contracts (Expired) transferred from BOTAŞ to Avrasya Gaz, Enerco, Bosphorus Gaz, Shell*

Source: PETFORM

New entrants in the market started to negotiate directly with Gazprom Export instead of BOTAŞ and signed contracts for 4 billion cubic meters a year (bcm/yr). In addition to this, an access code was passed, granting third parties access to LNG terminals and underground storage facilities. In 2012, new importers signed contracts for 6 bcm/yr and the share of the market controlled by private companies went up to10 bcm/yr. According to the Law, BOTAŞ import share should have reduced to 20% in 2019, but it has not succeeded in transferring its share or relasing its volume.

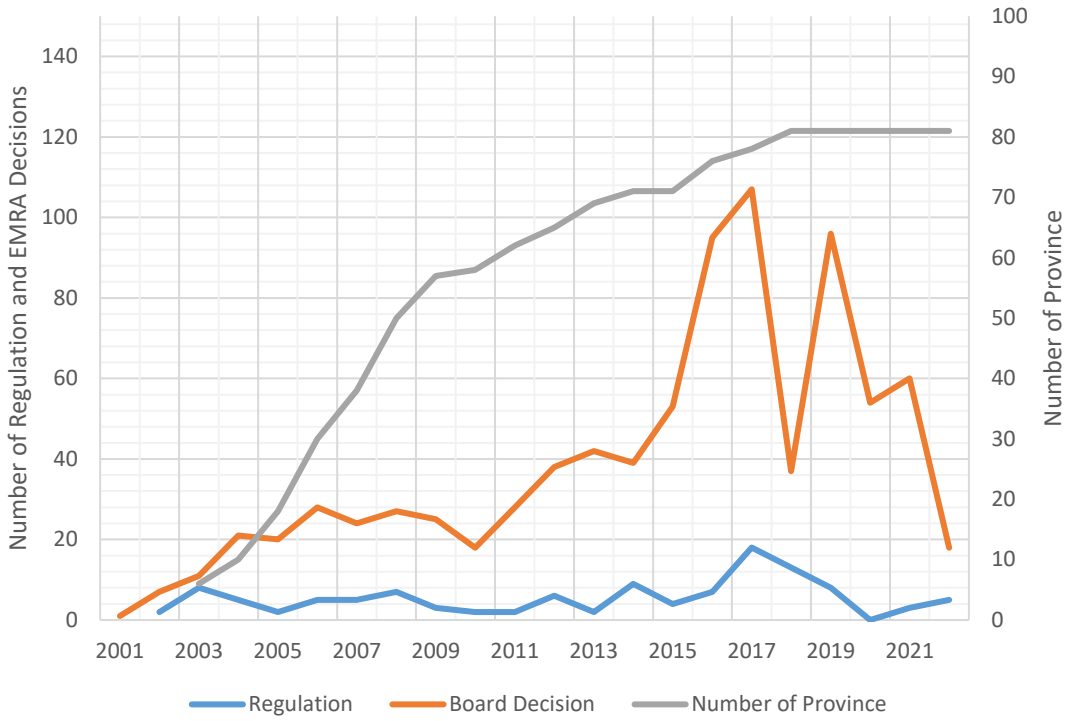


Figure 3. 1 Number of regulations and EMRA Decisions

Source: EMRA

Türkiye has implemented many regulations decided on by EMRA (**Figure 3.1**). As it can be clearly seen from the figure, number of board decision are increasing with respect to the number of province. However, after natural gas insfructure is completed in the most of the provinces in Türkiye, number of regulations and board decisions is started to decrease. Since board decisions inclue tariffs, requirements for tenders in a province, and other decisions related to natural gas distribution companies which can make an offer for being distribution system operator, the board decision is not increasing over the years.

4. ANALYSIS OF TURKISH GAS MARKET

In this chapter, a survey of the opinions of experts who have experience in the Turkish natural gas market is analysed. Firstly, the design of the survey is explained in detail, including the principles and measures queried After a brief summary, the results of the survey are shared and all statistics and suggestions made by the participants are explained. At the end of this chapter, Türkiye's natural gas market is compared with the best practices of both mature and developing gas hubs.

4.1 About the Survey

A survey was conducted from July 27 to August 12, 2022 among major market players to evaluate their opinion onthe performance of the Turkish natural gas market. A total of 173 experts, 114 from private companies, 32 from academia, and 27 from the public sector, including the Energy Market Regulation Agency (EMRA) and Ministry of Energy and Natural Resources (MENR), were randomly selected for this purpose (**Table 1.6**). Overall, the response rate was 34.1%, of which the private sector was the highest at 40.4%. Although the results varied depending on country and several other factors, this rate is reasonable based on the standards of the American Association for Public Opinion Research (AAPOR) (AAPOR, 2016) and Harzing (1997).

Table 1. 6 Number of survey participants

	Company	University	Public	Total
Number of invited people	114	32	27	173
Number of respondents	46	7	6	59
Share, %	40.4	21.9	22.2	34.1

In this study, seventeen themes were used to evaluate the main principles and measures that are typically used to evaluate the performance of the Turkish natural gas market which were included in random order in the questionnaire (**Table 1.7**). Fifteen of the themes are related to different principles and measures, the 16th theme is about overall assessment of the market, and the 17th theme is an open-ended question, asking participants their suggestions about what to do to improve the gas market. The themes were selected based on the European Gas Model of European Union Agency for the

Cooperation of Energy Regulators (ACER) (ACER, 2015), the European Gas Hub Study of the European Federation of Energy Traders (EFET) (EFET, 2020), and informal interviews with several market players.

Table 1. 7 Themes included in the questionnaire of survey.

No	Themes
1	Natural gas market is operated (by the TSO) in a fair and non-discriminatory manner
2	Regulators and/or governments could impose regulatory measures on market players to be able to run the market effectively.
3	There is only one natural gas hub on the same balancing zone/entry-exit system
4	Process of licensing companies is as easy and low-cost as possible
5	There is a standard commercial agreement used by all market participants
6	Agreements are made by brokers
7	Natural gas can be traded without signing an agreement with TSO at the virtual entry/exit point
8	A transparent and cost-reflective fees regime is set
9	Hub price is transparent, reliable and can be used as a refence price
10	The market is a transparent where all information and documents can be easily accessed by market participants
11	A clear set of rules (Networkcodes etc.) id defined
12	Market participants are asked to present a collateral proportional to their exposure
13	A fair financial collateral system is established
14	Presence of a clearing house (CH) acting as a central counterpart and providing clearing services for several gas exchanges
15	Different contract types (daily, weekly, monthly, and yearly) are available on the market
16	How do you evaluate the Turkish natural gas market in general?
17	What do you suggest for Turkish gas market to be more successful?

In this study, a five-category, Likert-type scale was used to evaluate each of the themes, namely very dissatisfactory (1), dissatisfactory (2), neutral (3), satisfactory (4), and very satisfactory (5). This is a subjective, qualitative assessment and all structures and activities of the Turkish gas market were examined thoroughly to decide whether the themes are satisfactory. Then, each theme was given a score.

4.2 Results of the Survey

The average rating of the 16 themes from the 59 respondents was 3.11. The averages and standard deviations of each respondent are given in **Figure 3.2.** Seven respondents, whose standard deviations were very close to each other, are grouped into two groups. These outliers are classified as “over optimists” and “over pessimists” since their rating of each theme is very similar. The remining 21 respondents are grouped between 2.25 and 2.84,

and are grouped 31 between 3.00 and 3.88, namely dissatisfactory (35.6%) and neutral (52.5%), respectively.

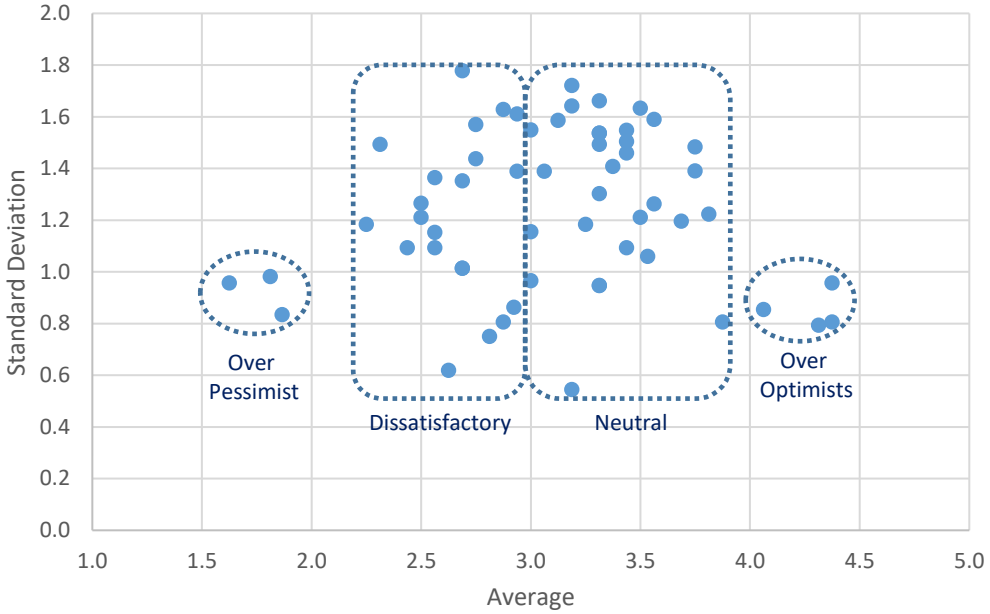


Figure 3. 2 Average and standard deviations of 59 respondents.

An alternative method was also used to compare the results applied in each method. Since Hierarchical Clustering (HC) helps to identify similar patterns in a given data set, the HC allows to align objects to clusters. Before plotting a dendrogram to see how many clusters were needed, Principal Component Analysis (PCA) was used to do the dimensionality reduction since the PCA also helps to identify similar patterns. After applying the PCA to the given dataset, the dendrogram of cluster analysis was plotted and the responses to questions were clustered into two groups: satisfactory and not satisfactory (**Figure 3.3**). However, a meaningful explanation for this grouping could not be made since the online survey was fully anonymous. Please also note that questions (x-axis) in dendrogram starts from 0.

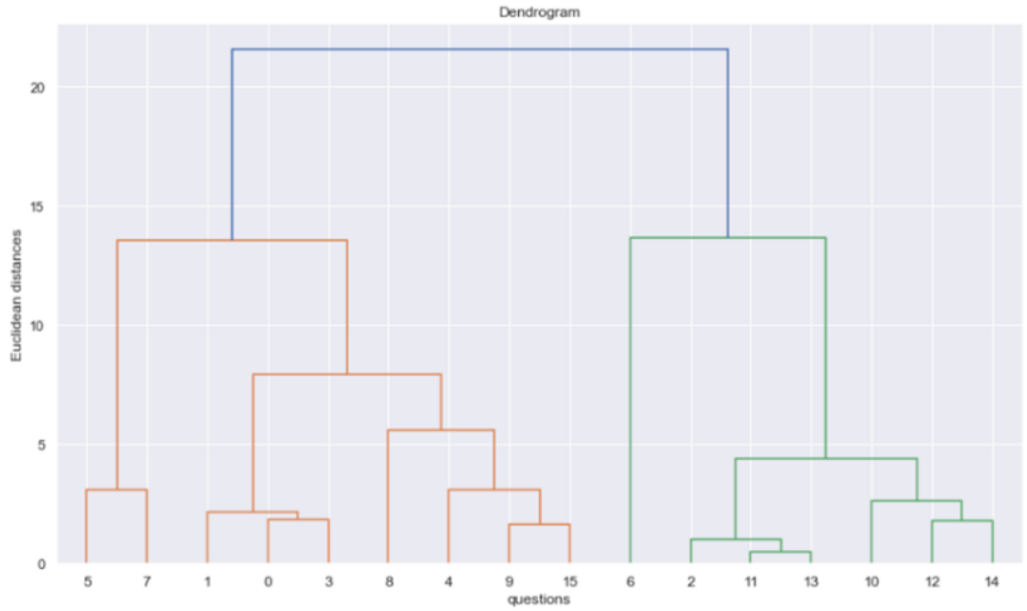


Figure 3. 3 Dendrogram of cluster analysis.

Figure 3.4 depicts the averages and standard deviations of 16 of the questions. Themes 6 and 8 were rated very dissatisfactory, 5, 9, 10, and 16 dissatisfactory, 1, 2, 4, 7, 11, 13, 14, and 15 neutral, and only 3 and 12 satisfactory. The respondents found none of the themes very satisfactory. The cluster analysis grouped them into two groups shown represented by green and brown in the table.

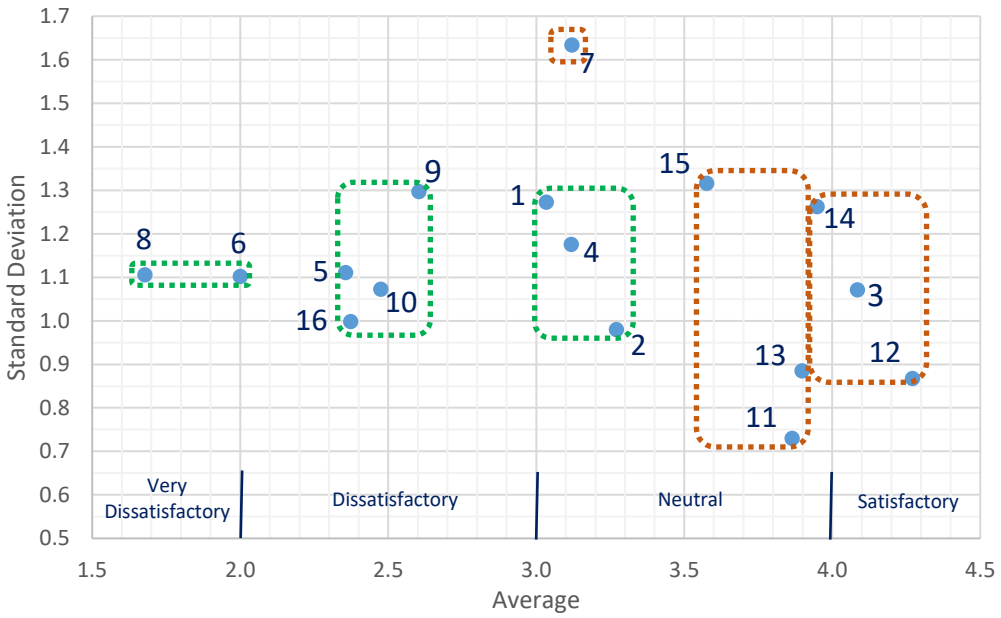


Figure 3. 4 Cluster analysis groups are shown in green and brown

Only 42 out of 59 respondents answered question 17. In their answers to this open-ended question, they made 62 suggestions (**Table 1.8**). Four of the suggestions, which accounted for 82% of all responses, were: (1) Market-based pricing and elimination of subsidies (17 times), (2) Establishing a perfectly competitive and liberal market (14 times), (3) Improving transparency and data sharing (12 times), and (4) Share of private companies, including in gas import should be increased (8 times).

Table 1. 8 Suggestions made by respondents.

No	Suggestions	Frequency
1	Market-based pricing and elimination of subsidies	17
2	Establishing a perfectly competitive and liberal market	14
3	Improving transparency and data sharing	12
4	Share of private companies, including in gas import should be increased	8
5	Creating a fair and just market	4
6	Long-term strategic planning should be done instead of short-term policies	3
7	Creating and sustaining an independent regulator	2
8	Decreasing influence of government on the market	1
9	Measures should be taken for Türkiye to be an energy HUB	1
Total		62

In conclusion, the survey clearly shows that the major players in the market evaluated the overall performance of the Turkish natural gas market as dissatisfactory (average of question 16 is 2.37). However, the average response to all questions was neutral (average is 3.10) and these results reflect the subjective opinions of the major players and - similar to other surveys carried out in in reference to Turkiye's energy sector, - it suffers from the decoupling of "knowledge-action gap", 'declared vs revealed preferences' or "knowledge-action gap" as noted by Bidgely (2018) and Şanlı (2022). However, it clearly shows that the three most import areas which should be improved, in the opinion of the market players, are: (1) prices, (2) transparency, and (3) the role of the private sector. These areas are examined thoroughly in the following sections.

4.2.1 Prices

As Hulsfod et al. (2016) noted in their study, since oil and gas had a strong relationship in terms of subsitute processes, price was based on the oil index during the 20th and early 21st century in Europe. After countries started to open internal gas markets to

competition, gas togas competition changed the price mechanism in Europe, and it has also becomea role model for developing or emerging gas markets. However, today some countries are still using the oil index. In a study conducted by Çetin and Yuksel (2014), gas prices in Türkiye are also set to oil indexation and BOTAS has not been willing to reflect prices volatilities in final gas prices, even if the EMRA and regulations points to a cost-based pricing mechanism. As it can be clearly seen from figure **Figure 3.5** and **Figure 3.6**, the tariffs do not correlate with EU prices.

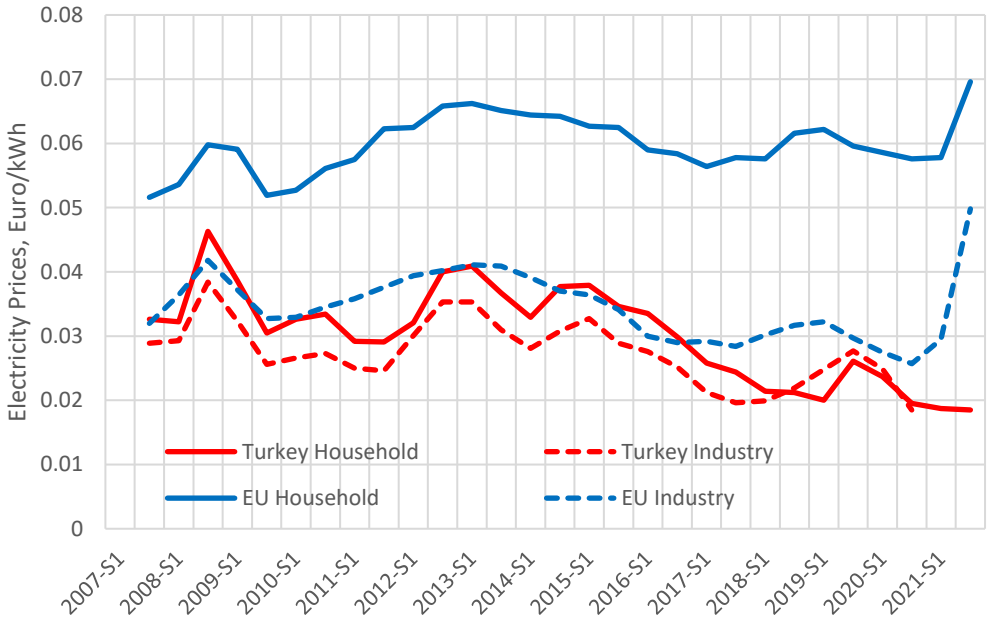


Figure 3. 5 Gas prices for domestic consumers (Band D3) and industrial consumers (Band I4).

Source: ESTAT, 2022

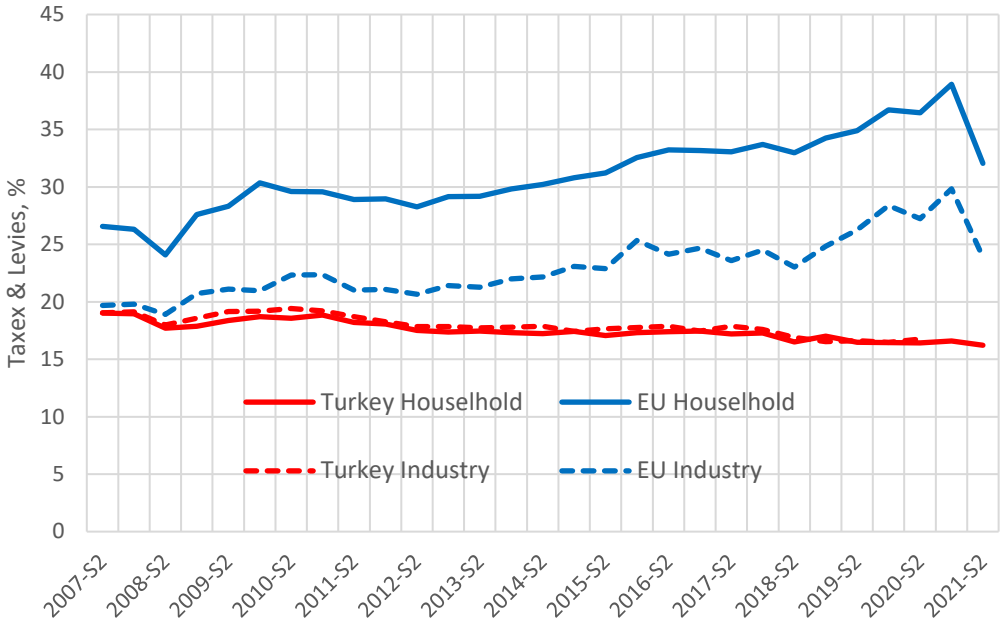


Figure 3. 6 Taxes and Levies for domestic consumers (Band D3) and industrial consumers (Band I4).

Source: ESTAT, 2022

Since long-term gas contracts are not accessible by third parties, how prices are fixed is not known, but it is generally believed that all Turkish contracts are linked to a formula which takes into account the average prices over the previous 6-9 months (Nalbant et al., 2020; Rzayeva, 2017). According to a report, BOTAŞ contracts signed with Gazprom were based on the 9-month moving price of Brent oil (PWC, 2021). As it can be clearly seen from **Figure 3.7.**, there is a strong relationship between BOTAŞ expenditures and oil prices.

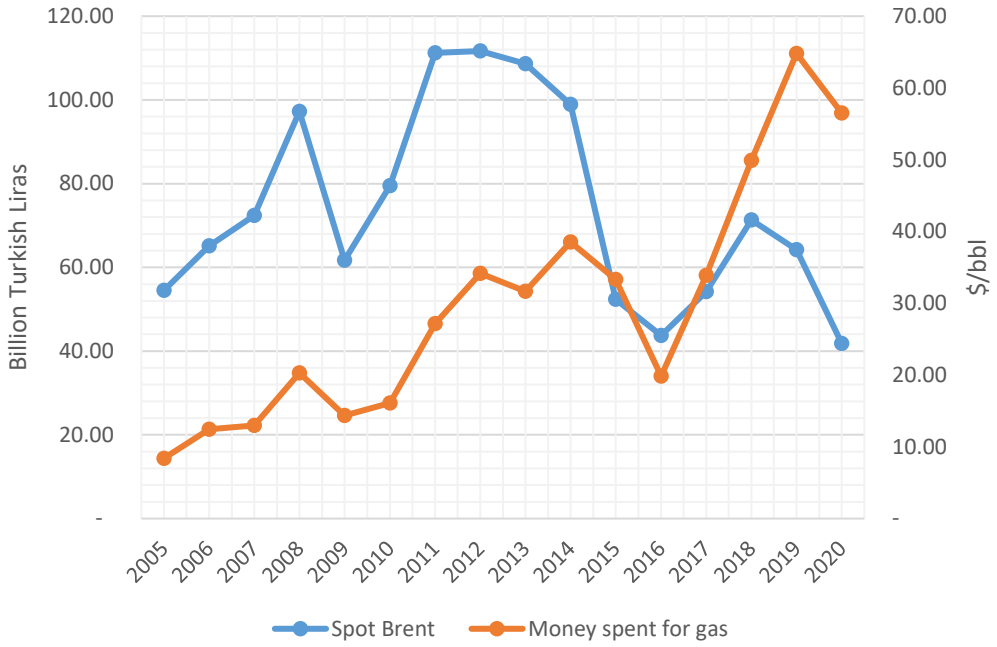


Figure 3. 7 Relationship between BOTAŞ purchases and spot Brent oil

Source: Ownership Reports for State Owned Enterprises & BP

4.2.2 Transparency

The uncertainty caused by a lack of transparency is recognized by all market participants and entrants as an obstacle to all who may be willingto make an investment in the business, and also affects the reliability and liquidity in a market (Camadan & Kölmek, 2013;İcik & Atak, 2021). Although transparency is considered one of the key element when opening energy markets to competition, developing or emerging markets sometimes do not understand how transperancy affects the future of energy markets. Even though Türkiye has a number of supply sources via different pipeline entry points, the lack of access to realtime information on these sources has caused the Turkish gas market to be regarded as an unpredictable natural gas market. For example, Türkiye has been importing natural gas from Iran for 19 years, but the contents of the contract is not publicly known due to confidentiality Moreover, the price of the gas and its methodology has never been published by BOTAŞ, whereas the Germany average import price is published regularly by the Federal Office for Economic Affairs and Export Control (BAFA). For this reason, one of the root causes for not having a well-functioning gas hub

in Turkiye is the lack of transparency and the lack of improvement in removing the barriers to the free flow of information. Unless the gas market is considered predictable by market players and speculation of monopolistic actions is removed, market development will not mature (IICEC, 2019). According to the Law, the Turkish natural gas market is expected to transform into a more transparent and competitive one. Some positive improvements have been observed in the direction of liberalization, but lack of competition and transparency remain as the main issues that need to be overcome (Tunçalp, 2015). Therefore, the legal framework of the Natural Gas Market Law has not been fully implemented (Rzayeva, 2020). According to Demir (2016, p.268) "[…] *A notable degree of vertical integration and foreclosure on upstream and downstream activities has been seen in the Turkish gas market and it is confirmed by the interviewees that due to longterm gas purchase contracts, severe ToP restrictions and political circumstances of the supplier countries the incumbent, BOTAS, is not yet totally willing to abandon its historical monopolistic position for the years to come. This being the case, it is appropriate to question the magnitude and strategic significance of the natural monopoly theory, as advocated by its extant apologists, that economies of scale cause declining average costs or market prices would really be achieved without governmental subsidies. Due to lack of data and transparency, any assessment of the cost and potential for development becomes almost impossible in the Turkish gas market."*

Separatley, the Organized Wholesale Natural Gas Market (Natural Gas Exchange) was established under EPİAŞ, which is responsible for operating and managing the the gas market and providing several services to counterparties. With the development of the natural gas exchange, natural gas can be traded on a daily, weekly and monthly basis. In addition to this, the Forward Natural Gas Market was launched on the 1st of October 2021. The motivation behind the forward market is to allow all participants, who are actively trading in Turkish gas market, to reduce their risks and protect their portfolios from the price spikes the industry may face over the long haul. However, based on a study of transactions over a four-year period, both spot and future markets have not made a significant impact on the building of well-functioning gas market. Since the platform has been operated by EPİAŞ since 2018, the majority of transactions have been made by BOTAŞ. The share of BOTAŞ on the Natural Gas Exhange has distorted prices and driven

private companies out of the market. Moreover, since The Turkish Natural Gas Reference Price (GRF) should be influenced by the transactions on this platform, BOTAŞ' transactions (**Figure 3.8**) affect the the GRF and it is not known whether the prices reflect the real gas prices or is subsidized by BOTAŞ.

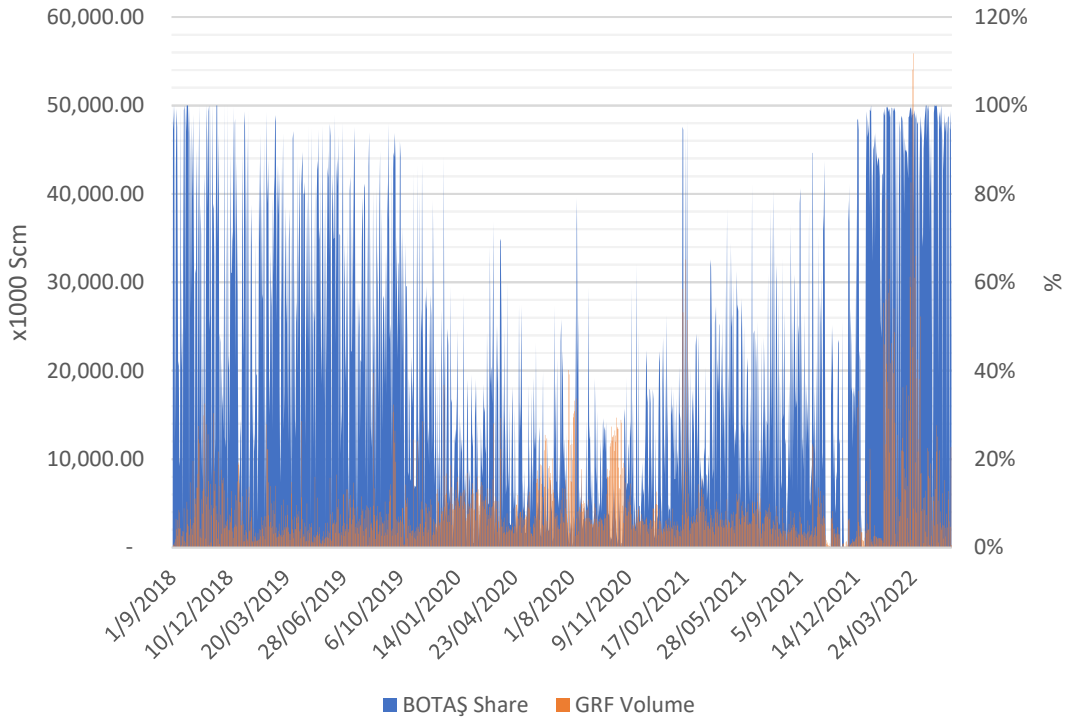


Figure 3. 8 BOTAŞ share on gas exchange platform

Source: EXIST

Although the transparency platform on EPİAŞ gives users access to more detailed information, much more effort is needed so client or potential clients can access reliable and timely information on the platform. In short, all market participants should have the ability to access any information at any entry or exit point, so they can reach their business objective and citizens should be able to know the true price of natural gas.

4.2.3 Private Sector in Import

The natural gas market law was supposed to accelerate the liberalisation process, but BOTAŞ is still the dominant power in the gas market because of its huge market share. A monopoly in the state-owned gas company in the natural gas market results in a lack of competition and drives private companies out of the market. In such a case, state-

owned company control enables it to control market activities and stems from political reasons. As it can be clearly seen from **Figure 3.9**, BOTAŞ's market share has remained above 90,0% over the last 4 years.

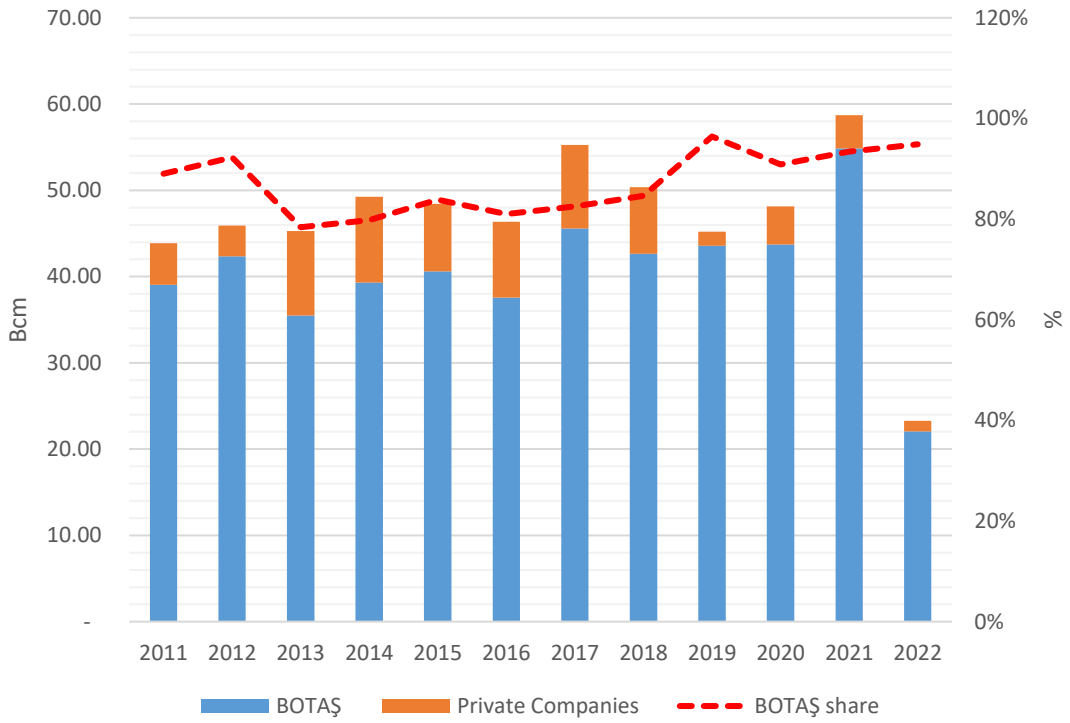


Figure 3. 9 BOTAŞ market share

Source: EMRA Natural Gas Market Reports

Due to BOTAS's monopoly, the market players (i.e. shippers) have faced several problems. The first problem is that the state-owned company regulated tariff does not reflect cost-based price methodology.

As a result of this, while the market share of the private companies is decreasing, BOTAŞ's share is plateauing. According to PWC report (2014, p.8), "*BOTAŞ pricing policy has not only distorted competition, but has also affected its own financial position, leading to questions about its sustainability*". According to data provided by the Ministry of Treasury and Finance (**Figure 4.1**), BOTAS's net loss was 5,6 billion Turkish liras in 2019 (Ownership Report for State Owned Enterprises, 2019).

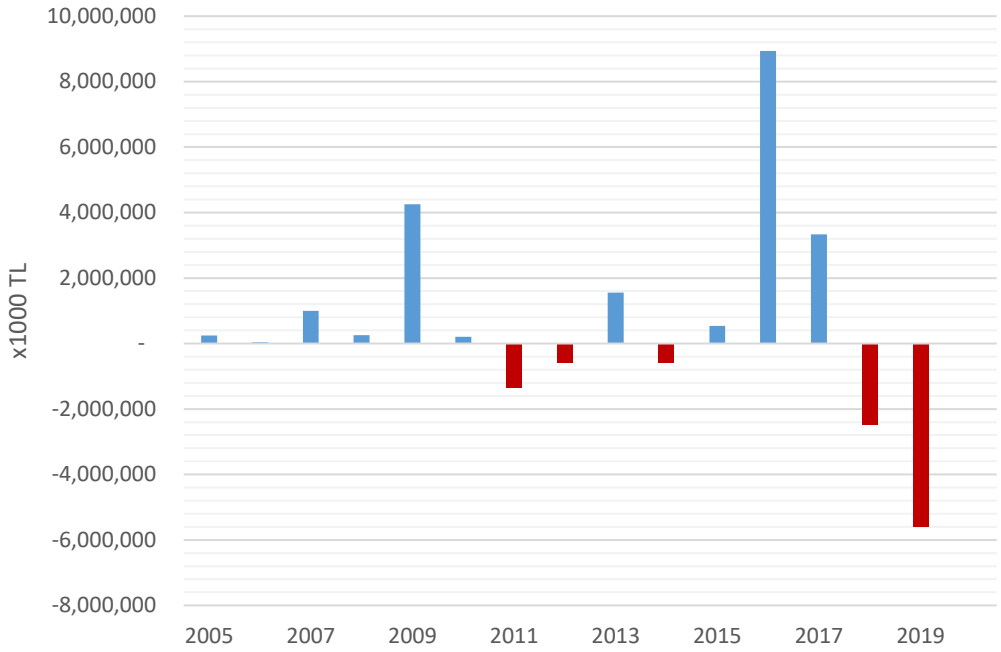


Figure 4. 1 BOTAŞ net balance

Source: Ownership Report for State Owned Enterprises

4.3 Comparison with Best Practices

The European Federation of Energy Traders (EFET) is an institution that oversees developing and mature virtual trading points across EU according to transparency, competition and market freedom. By doing this, the EFET is trying to develop a practical model based on the experiences of these countries in their own market. As a result, EFET aims to produce a practical guide for designing market hubs and promoting liquidity. The institution publishes an annual study and compares different developing hubs and less mature markets on a variety of parameters. To be able to implement this study, each gas market is evaluated on 18 criteria (**Figure 4.2**). In EFET's 2021 study, Türkiye gets 11.5 out of 20. Although Türkiye has met many criteria in this study, there should be more progress on the other criterias. For example, market interference, concentration issues, voluntary market makers and hub price as bencmark are the areas rated as 0 according to EFET assessment although rest of the criterias fully or partially meet the expectations. Turkiye's plans for forward contracts could boost Türkiye's overall score and it speed up her ambition to be a major gas hub.

Criteria	Responsible party	Heading 2021	Guidelines for assessment 2020	Türkiye
1.a	NRA and/or Ministry	Transparency and consultation	**0.5** if relevant market access documents and/or legislation transparent and easily accessible on the internet; **1** if there is also regular consultation/stakeholder dialogue on relevant market issues; **1.5** if all of the above undertaken in English	0.5
1.b	TSO/Market Area Manager/Market Operator			1
2	TSO	Entry-exit system established	**0** if no transmission Entry Exit and/or VTP; **0.5** if transmission Entry Exit but with conditional capacity only available at certain points, restricting access to VTP or Entry Exist co-exsting with point to point within a country; **1** if transmission Entry Exit with full access to VTP	1
3	TSO	Title Transfer	**1** if gas can be traded without having to enter into a transportation contract for physical delivery (nomination of flows) by way of trade notifications transferring gas between balancing groups at the VTP; **0.5** if gas can be traded at the VTP but a transportation contract is required; **0** otherwise. NB Balancing accounts (established through contracts or the network code) may still be legitimately required of pure traders	1
4	TSO	Cashout rules (long short positions imbalances set to zero at the end of the day with payment/receipt of imbalance charge in local currency/MWh)	**0** if non-daily or non-financial cashout; **0.5** if rolling imbalances with linepack flexibility service or daily cash out with tolerances; **1** otherwise	1

5	TSO/Market Area Manager/Market Operator	TSO system balancing	**1** if TSO relies exclusively on short term standardised products (Article 7 of BAL NC); **0.5** if short term standardised products are used in conjunction with balancing services (Article 8 of BAL NC) such as load flow commitments or TSO storage; **0** if balancing services are used exclusively.NB arrangements intended to apply only in emergency situations, such as long-term load shedding options (in Germany) and operating margins (in UK) do not apply	1
6.a	NRA/Ministry	Licensing and reporting obligations	**0** if licensing and reporting obligations are considered to be overly bureaucratic and a barrier to market entry; **0.5** if either liensing or reporting obligations are considered overly bureaucratic and are barrier; **1** otherwise	0.5
6.b		Market interference	**0** if damaging instances of market inteference are prevalent; **0.5** if irregular market intervention has occurred with justification, **1** if market intervention is not perceived to be an issue	0
7	NRA	Resolve market structural and concentration issues (defined role for historical player if flexibility/liquidity is scarce)	**0** if market hampered by structural or market concentration issue; **0.5** if gas/capacity release programs have been applied; **1** if mandatoty market maker obligations or if no perceived structural or market concentration issues	0
8	NRA, TSO or Market Operator	NRA fees or Hub fees (not fees relating to participating on a exchange or trading platform)	**0** if discretionary or non-transparent; **0.5** if regulated or transparent and shown to be cost reflective; **1** if no fees or fees part of regulated TSO costs	0.5
9	Market	Establish a reference price at the hub for contract settlement in the event of default	**1** if price always available based on Article 22 of BAL NC; **0.5** if proxy price based on neighboring hub; **0** if adminstered	1
10	Market	Standardised contract	**1** if standard trading agreement (EFET or equivalent) widely used by all	1

			market participants, **0** otherwise	
11	Market	Price Reporting Agencies producing daily prices at the hub	**1** if more than one, **0.5** if only one or none daily publication; **0** if none	1
12	Market	Voluntary market makers operating at the hub	**0** if none and liquidity is low and/or bid/offer spreads are wide; **0.5** if 1 or 2; **1** if several or not necessary because of high liquidity and narrow bid/offer spreads	0
13	Market	Brokers	**0** in no brokers; **0.5** if voice brokers or 1 or 2 screen brokers; **1** if more than 2 screen brokers. Plus additionl **1.5** if screen brokers linked to Trayport	0.5
14	NRA	Establishment of exchange	**0** in no exchange; **0.5** if non-cleared exchange; **1** if cleared exchange. Plus additional **1.5** if cleared exchange is linked to Trayport	1
15	Market	Hub price becomes reliable and used as benchmark	**0** if hub price not transparent or trusted; **0.5** if hub price used as the basis for settling short term trades; **1** if hub price used in at long term contracts (e.g. storage and supply) of at least a year	0
16	Market	Hub spot (shorter than monthly products) liquidity	**0** if total annual traded spot volume (OTC + exchange) is <50 TWh **0.5** if volume >50 TWh but < 150 TWh; **1** if >150 TWh	0.5
Total				**11.5**

Figure 4. 2 Gas hub development

Source: EFET, 2021

According to remarks provided by EFET, hub countries with a score of 15 or more are considered mature or developed markets (**Figure 4.3**). Türkiye needs to take several significant steps to become a more mature gas hub. For this reason, both Turkish policy makers and public authorities should broaden the scope of the Turkish gas market by taking into account internationally recognized criteria. However, only 12 out of 28 countries were evaluated and considered as mature hubs and markets in 2021.

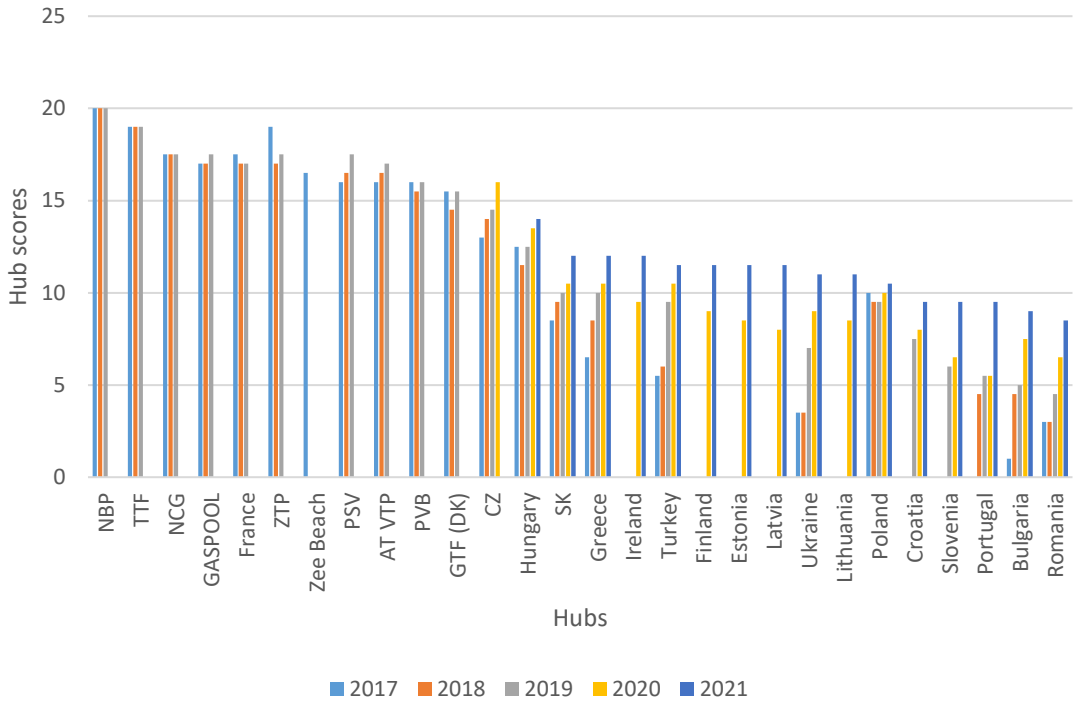


Figure 4. 3 EFET 2021 Gas hub benchmarking study

Source: EFET, 2021

5. CONCLUSION AND RECOMMENDATION

The main purpose of this study is to analyze the performance of the Turkish natural gas market in liberalization and to discuss to what extent gas market reform has been successful. Although Türkiye has aimed to liberalize internal natural gas market in a good faith and made progress in some extent, today Türkiye is far away from being a liberal gas market and becoming a regional hub ambition. In the last 22 years, important steps were taken for becoming a well functinoning gas market, particularly aiming to become a regional natural gas hub. After the Natural Gas Market Law 4646 entered into force, liberalization process was speed up every year. On the one hand transmission network owned and operated by BOTAŞ was opened to third party access for the first time, on the other some of contract volumes signed between BOTAŞ and Gazprom transferred to private companies and contract release programmes were successfully made. Although all these and other positive developments have been performed, today the position of Turkish natural gas market is not satisfactory. Therefore, in this study, I analyze the performance of the Turkish natural gas market and to discuss why Turkish natural gas market is not satisfactory even though many encouraging steps have been taken so far.

I analyzed European energy directives and regulations in an effort to understand effective implementation of a well-functioning natural gas market, and took it as a role model for Türkiye. I then evaluated how these reforms have shaped European gas and electricity markets and how these policies and reforms have contributed to Europe's natural gas security. When the Turkish natural gas market is compared with other developed gas markets such as NBP and Dutch TTP, it is seen that there are some deficiencies. According to assessment made by EFET, Türkiye does not meet some of the criterias which are related with market interference, concentration issues, scarce of liquidity, transparency, and untrusted reference price. For this reason, while the NBP and Dutch TTF received the highest score of 20, Türkiye received 11.5 point. Since gas markets with a score above 15 are seen as a developed market, the Turkish gas market is considered as a developing market.

On the other hand, I conducted a survey among major players of the Turkish gas market to evaluate their opinions. Principles and measures are used to evaluate the performance of the Turkish natural gas market. In order to do this, the questionnaire was prepared in themes that are related to different principles and measures. A survey was then shared and conducted with participants who are major market players, experts and academicians. The survey clearly shows that the major players in the market evaluated the overall performance of the Turkish natural gas market as dissatisfactory. It also shows that the three most import areas which should be improved, in the opinion of the market players, are: (1) prices, (2) transparency, and (3) the role of the private sector.

As for conclusion about the Turkish natural gas market, Türkiye should follow several steps. At first, if Türkiye is being a liberal gas market, the Turkish natural gas market needs to be more transparent. All market participants should have instant access to all kinds of information at any point, and the right to access any information should be protected by necessary legal amendments. In addition to this, BOTAŞ should be a market maker for the development of well functioning gas market, but should not control the market. Second, cost-based pricing model should be adopted and calculation methodology sould be shared with both market participants and citizens. In connection with this, BOTAŞ should stop subsidizing natural gas prices, and social tariff methodologies that are in place in Europe or elsewhere in the world should be established and subsidies should be provided only to those in need. Third, the market share of BOTAŞ should be reduced to the levels specified in the Natural Gas Market Law 4646 and the share of private sector should be increased by transferring the existing gas agreements of BOTAŞ to the private sector. However, an important point needs to be mentioned here, the reduction BOTAŞ' market share should be tied to a timetable and a gradual reduction should be aimed instead of large transfers in a sort time period as planned in the past. In addition, the increase in the share of the private sector should not allow new monopolies to emerge in the market. For this reason, while increasing the share of the private sector, attention should be paid to the formation of new entrants and to avoid movements aimed at contolling the market as a group. In summary, there is no doubt that taking the above-mentioned recommendations will both contribute to the

liberalization of natural gas market and make it easier to meet the standarts determined by international organizations.

As final verdicts, Türkiye should definetly take into account the evaluations of international organizations to be able to reach the necessary benchmarks to become a well-functioning natural gas hub. For this reason, considered planning and solid implementation is needed to evolve the internal market. Without these contributions, Türkiye will never achieve her gas hub ambition and Türkiye's position will remain as a gas transit country. Prices, transparency and the role of private sector are the areas that should be improved at first. An improvement in any of these areas will ultimately contribute to improvement in more than one area because these improvements can be considered as prerequisites for market openning. Without a fully-liberalized gas market, today's market position is dooming the prospects of becoming a gas hub.

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