

IICEC ENERGY AND CLIMATE RESEARCH PAPER



**THE MISSING PIECE
IN THE TURKEY'S GAS
HUB AMBITIONS**

June 2019

Kerem Topuz

Founding Partner of the MNCM Consulting

Table of Contents

A. Introduction	4
1. European Natural Gas Markets	4
2. Turkey	5
B. Natural Gas in World Energy System	6
C. Role of Natural Gas in Turkish Energy Sector	7
1. Natural Gas in Total Primary Energy Supply and Demand	7
2. Turkey’s Natural Gas Infrastructure	8
3. Natural Gas in Power Generation	9
4. Natural Gas in Industry and Buildings	10
5. Natural Gas Market Status	12
D. What is a Gas Trading Hub?	15
E. Potential Benefits of a Regional Gas Hub in Turkey	16
1. Why is it beneficial for Turkey?	16
i. Energy Security Objectives	16
ii. Macro–Economy Related Benefits	17
iii. Environmental Performance	18
iv. New Services and Other Value Add from a New Business in Turkey	19
2. Why a Turkish Hub is Beneficial for Turkey’s Natural Gas Suppliers	20
i. Rebranding Gas Molecules	20
ii. Resources and Suppliers in the Region	21
iii. Increased Exports	23
iv. More Demand is Better than Restrictive Contracts	24
v. Hedging and risk management by means of a liquid growth market	25
3. Why a Turkish Hub is Beneficial for Demanding Markets?	26
i. Increased competition in European Gas Markets	26
ii. Increased availability and flexibility of Gas in SEE	27
F. What is Essential to Develop a Regional Gas Hub in Turkey?	29
1. Comparison of Turkey’s Status with Established Hubs in Europe	29
i. ACER Market Health Metrics	30
ii. EFET Gas Hubs Study	31
2. Four Pillars of a Well-Functioning Natural Gas Hub	33
i. Physical Infrastructure	33
ii. Network Operations	35
iii. Commercial Issues and Market	35
iv. Overall Regulatory Framework	37

Highlights

- The international natural gas market has evolved away from long-term take-or-pay contracts that are linked to oil prices and include trade restrictions from destination clauses. Instead the market now features shorter-term contracts without destination clauses and pricing based on the supply-demand dynamics of natural gas instead of oil-linked prices. In line with these developments, the volume of spot gas trade has also significantly increased.
- Due to the limitations and cost of transporting natural gas, competitive price discovery of natural gas requires transparent gas commodity markets that reflect supply and demand conditions in the markets for which natural gas is being supplied, purchased and used.
- A physical natural gas trading hub, along with its associated infrastructure, would enhance the energy security of Turkey and Southeast Europe.
- Because of the large volume of gas being imported into Turkey from multiple sources and Turkey's already well-advanced natural gas infrastructure, Turkey has unique locational advantages for such a hub.
- Establishing such a hub would be a win-win-win for Turkey, Europe and Turkey's natural gas suppliers. The reasoning behind what may seem to be a counterintuitive conclusion is contained in Section E of the paper.
- In order to put the question of a Turkish natural gas hub into perspective, the paper provides information about:
 - Turkey's natural gas use in each economic sector
 - Turkey's natural gas import pipelines and distribution infrastructure
 - Turkey's LNG regasification capacities
 - Gas demand outlook in Turkey and in Europe
 - Requirements for a well-functioning trading hub
 - An assessment of Turkey's ability to meet these requirements
- The additional infrastructure requirements for a Turkish gas hub are minor compared to the changes that would be required in a) renegotiating natural gas import contracts to eliminate destination clauses and achieve more flexible pricing terms; and b) unbundling BOTAŞ contracts sufficiently to meet the requirements of a transparent gas trading hub where no party can exercise control over prices.
- BOTAŞ continues to be necessary to be a counterparty for new pipeline investments and to provide price stability in Turkey in light of the Turkish economy and consumers. At the same time, Turkey would benefit from lessening current dependencies on the state towards a market system.
- Moving in this direction would be an evolutionary process. BOTAŞ' current long-term contracts will not be terminated until mid-2020's. A certain amount of time must elapse before BOTAŞ would be able to unbundle its contracts and other policies be established to protect Turkish consumers.
- If this approach were taken, Turkey would have a credible opportunity to establish a natural gas trading hub. Such a hub would provide substantial economic benefits to Turkey as well as its neighbors.



A. Introduction

1. European Natural Gas Markets

The international natural gas market has significantly changed since it first emerged several decades ago as an important part of the European energy economy. European international gas trade began with the construction of gas transmission pipelines that were financially secured with long term contracts. These typically linked the contracted gas price to oil prices and included destination clauses that prevented the resale of gas. However, during the 1970's the British Gas Corporation developed reforms partly in response to Britain's own North Sea resources moving to a "cost plus" pricing structure. As European gas demand was rapidly increasing after 1970, Russian, Algerian, Libyan, pipeline supplies were added to Europe's own resources. LNG supplies then expanded significantly after 1990. In 1996 Britain established the National Balancing Point which provided an opportunity to have more innovative natural gas contracts. Nonetheless, Continental Europe remained dependent on conventional contracts with Russia, the Netherlands and Norway indexed to oil prices. The rationale for such linkage was quickly disappearing as oil-to-gas switching became less of a factor in the power market as oil-fired power generation began to quickly disappear except in Italy and Spain. Later such switching became less significant in heating sector as well.

By 2008, it became apparent that the LNG supplies that had been intended to supply a large gas-thirsty U.S. market must be sold elsewhere. Much of this flowed to Asian, Middle East and Latin American markets but 30 BCM/yr. arrived in Europe since 2010. The pressure of rapidly rising and volatile oil prices from 2002 to 2008, the following price collapse and recovery and sharp increase after 2011 placed considerable stress on oil price-linked gas customers and drove a Europe wide gas market reform. The decline of oil-linked contracts has been very significant in North West Europe, less so in Central Europe while they are common in South East Europe and Mediterranean Europe. Despite the continuation of oil-price linked contracts, gas-on-gas competition has caused Gazprom to make pricing concessions to avoid losing market share. Nonetheless, European hub prices and oil prices remain highly correlated bringing into question whether natural gas and oil prices have actually become de-linked.

With the growth on LNG trade in the 1980s, there could have been an opportunity to move toward more flexible contract terms considering the flexibility of LNG transport to serve any destination with a liquefaction facility. However, supplier countries, particularly Qatar, were successful in maintaining a negotiating advantage and replicated the type of contracts that were more suitable for financing pipelines. Long term, oil-linked, destination clause contracts remained the norm for LNG trade. While a spot market for LNG would have been technically feasible, destination clauses ensured that it would not be significant and similar to what had happened with pipeline contracts gas customers needed to rely on long-term LNG contracts to achieve security of supply.

This picture began to change with the emergence of U.S. LNG supply. Because of the relatively unique circumstances that caused the emergence of U.S. LNG exports, the requirements of U.S. LNG exporters were quite different than export projects that involved LNG and natural gas supply infrastructure. In the U.S., large volumes of spot natural gas could be purchased by U.S. LNG exporters with little impact on U.S. gas prices since U.S. LNG exports constitute a small percentage of a large and price-elastic U.S. supply. U.S. LNG exporters offered contracts that did require "take-or-pay" for the gas. The contracts only needed to secure a return on liquefaction investments. In addition, destination clauses did not offer the advantages to U.S. LNG exporters that previous LNG exporters aimed to achieve with them. Consequently, they were dispensed with making U.S. LNG contracts more attractive. As U.S. gas prices had become among the lowest in the world, the prospects for U.S. LNG exporters gained considerable attention. U.S. LNG contract terms began to impact the world LNG market far more than the volumes of these first contracts might otherwise have implied. While the growth of U.S. LNG exports stalled due to the collapse of world LNG prices now, with the emerging second wave, the U.S. is expected, along with Qatar and Australia, to have roughly equal shares of approximately 80% of the world's LNG trade. Regardless of the influence one wants to attribute to the introduction of the liberal U.S. LNG contract terms, the world LNG market has evolved significantly since 2010. The percentage of spot LNG traded has increased from less than 10% (2010) to close to 30% (2018). Also LNG contracts are now typically available for short periods of time (e.g., 5 years).

Despite the evolution of the European natural gas market towards a more competitive structure, there is a need for an improved balance of power between gas customers and suppliers. Increased availability of spot LNG can contribute in a more secure and sustainable market in the coming years. However, some challenges still remain. For example, there is uncertain natural gas security for some European regions. Non-transparent pricing regimes is an issue in some regions,



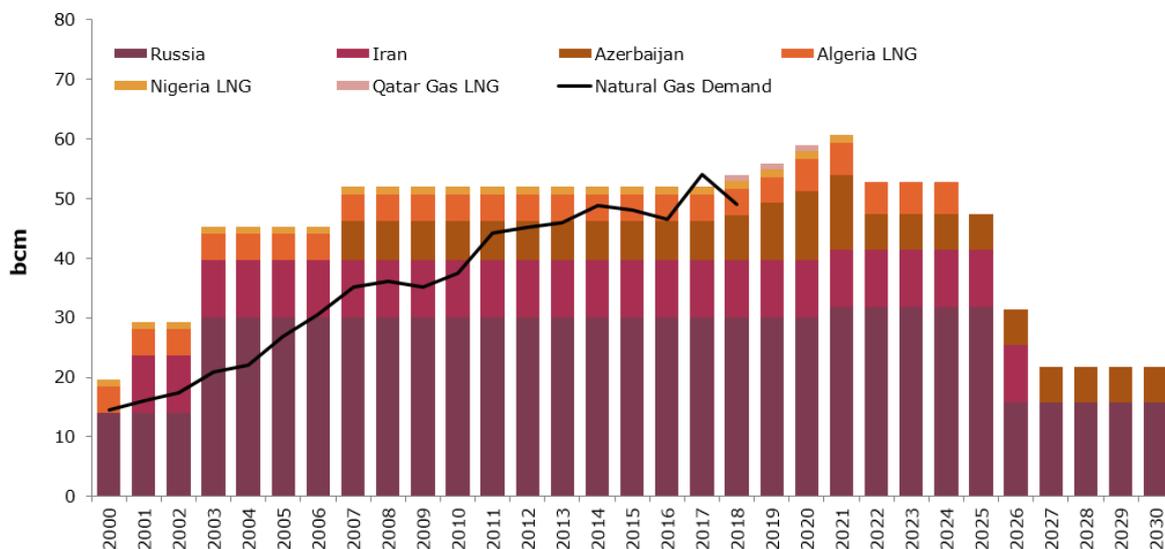
liquidity in forward contracts needs to be improved and despite increasing gas-to-gas competition across the continent hub pricing is still correlated with oil prices. Therefore European gas markets remain exposed to developments in global oil market, a situation completely different than the U.S. where gas prices are de-linked from oil prices.

The last but not the least, the main function of a well-functioning gas hub lies in its ability to establish natural gas as a transparent tradable commodity (like petroleum). However the difficulty remains that natural gas, with its low energy density, cannot be transported at low cost. Pricing and physical delivery need to be correlated. While most commodity contracts are closed only on paper (by “non-commercial” traders (necessary for any market to be sufficiently liquid), physical delivery or purchase at the pricing point helps ensure that hubs set prices rather than reflect prices. Consequently a transparent international natural gas trade requires regional pricing at hubs that provide physical supply and commodity trading in a competitive market framework. Lack of such an organized hub in the Anatolian-Balkan region highlights Turkey as a potential gas trading hub to fill that gap. Given Turkey’s increasing role as a natural gas transit country by means of ongoing pipeline projects, and its role as one of the largest natural gas consumers in Europe, this paper aims to provide some information and recommendations towards that objective.

2. Turkey

The natural gas usage in Turkey started in 1987 when BOTAŞ – the state owned natural gas and petroleum pipeline corporation – began importing natural gas from the former USSR. The first natural gas delivery was in 1987 from the West Line pipeline. As Turkey was not able to discover and produce indigenous natural gas supplies, it has instead built an economy highly dependent on imported natural gas as a primary energy source. The availability of natural gas supplies from nearby countries and the abundant advantages natural gas has as versatile and hydrocarbon fuel well explain why natural gas has been beneficial to the Turkish economy. As shown in Figure 1, Turkish natural gas consumption grew rapidly after 2000 reaching 53.9 bcm in 2017, corresponding to a CAGR of 17%¹. This rapid expansion was triggered by two main developments. Firstly, through the distribution grid privatization scheme which increased network penetration and subscription rates for residential customers on the provincial level across the country. The second is the commissioning of several large scale gas fired power generation facilities in response to the growing power demand. During this period, natural gas imports were diversified with new pipelines from Iran and Azerbaijan and LNG imports from Nigeria and Algeria. These new sources of supplies were secured by long-term contracts with BOTAŞ.

Developments of Natural Gas Demand and Long Term Contracts²



¹ Annual Natural Gas Sector Market Reports of EMRA

² Annual Natural Gas Sector Market Reports of EMRA



Turkey is well located to connect the world's major natural gas suppliers including Russia, Azerbaijan, the Middle East and the East Mediterranean, with the large gas-consuming continent of Europe. In addition, with its natural gas demand, Turkey has become an irreplaceable customer for these natural gas producing countries as Turkey's domestic gas production is almost negligible, making it dependent on imports. Turkey is Gazprom's second largest importer accounting for 15% of its sales (2017). As a result of Turkey's strategic location, it has a larger role in the global natural gas market than can be explained only by its status as a large natural gas customer. Besides Turkey's geostrategic location, its extensive natural gas infrastructure and numerous contractual relationships with a variety of foreign suppliers all support an even more significant Turkish role in the pan-European natural gas market. Nonetheless, there is a debate about what this enhanced role should be. Some experts assert that Turkey should be an active trading hub while others see Turkey only as a transit bridge between supply and demand nodes. Which role Turkey aspires to is not just a matter of national choice but the ability to provide the physical and market related prerequisites for a natural gas hub and exchange to function. This question becomes increasingly urgent as European policy makers strive for establishing supply security through diversification of source countries. Many pieces for a Turkish gas hub are in place including a large domestic consumption, an advanced natural gas distribution network, growing gas storage facilities, land-based and floating regasification terminals and source country diversification. If developed, this gas hub and exchange would contribute to European supply security by diversifying its sources of imports and gas transmission routes. Perhaps most important, a Turkish gas trading hub would provide Europe with a competitively priced commodity in addition to purchases from foreign gas suppliers. The economic benefits to Turkey would also be significant, not only to its energy sectors, but also would propel an expansion of Turkey's financial sectors in new directions.

In this study, stakeholder advantages of the aspired Turkish Hub will be assessed at a macro level. Only the direct stakeholders, namely Turkey, its suppliers, and Europe are evaluated. The list of potential advantages is not meant to be exhaustive, and potential challenges are not put in primary focus, with the aim being towards providing a positive alternative view that looks at the mutually beneficial aspects.

B. Natural Gas in World Energy System

Natural gas supplies about one fifth of the energy used worldwide and makes up nearly one fourth of electricity generation³. Moreover, it plays a crucial role as a primary fuel for industry. Being a highly versatile fuel, its growth is also fueled by its low emissions compared to other fossil fuels. Last 50 years have seen a rapid expansion of value chain development for natural gas, mainly in upstream and infrastructure investments.

As discussed above, the global and European gas markets have undergone significant changes in recent years in parallel with the wave of investments in liquefied natural gas (LNG) sector. The capacity increase of liquefaction has helped create oversupply whereas demand for the same period fell back in terms of pace of growth. Liquefaction capacity is increasing rapidly, especially in Australia, Russia, Qatar and United States, to the extent that it has disrupted the conventional gas trade business and pricing models. This has forced gas market players to revise their strategies in all markets involved, resulting in pricing concessions and conversion to hub pricing indexes from oil pricing indexes⁴.

Developing countries, especially China and India, are expanding the world-wide demand for natural gas since most of the developed countries, except United States, have witnessed plateauing demand. European natural gas demand had risen strongly until 2010s with strong economic growth and decommissioning of coal-fired power plants. Forecasts show that gas demand will remain relatively flat in the medium term due to both economic activity and energy efficiency measures. While natural gas demand rose sharply in Japan after the Fukushima nuclear core meltdown and subsequent closure of all Japanese nuclear power plants, Japan is restarting their nuclear fleet. Korea's nuclear plans remain somewhat uncertain but the country may continue to rely on nuclear power. Both countries, Japan and Korea, which consumed 45% of the globally traded LNG volumes in 2016, could have an impact on the LNG market depending on their future nuclear power policies⁵.

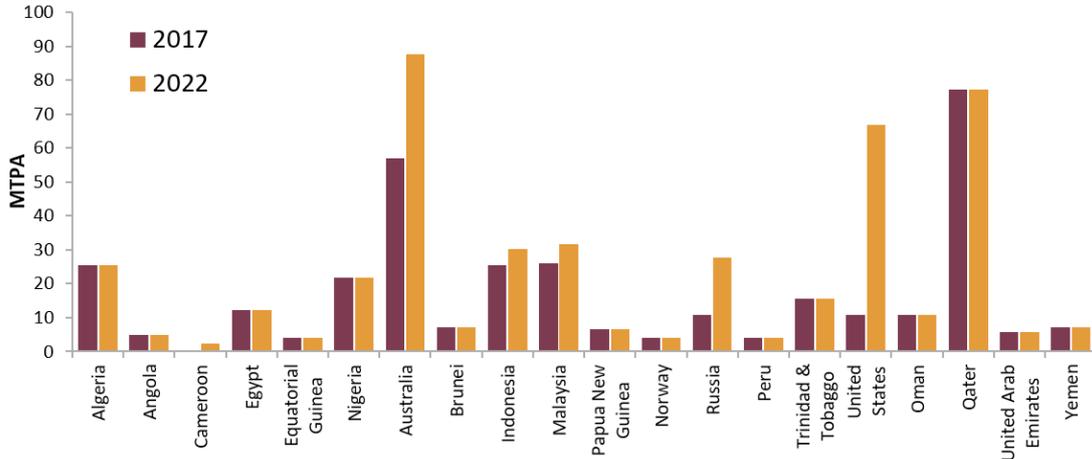
³ IEA, Global Energy Outlook 2017

⁴ IEA – Global Gas Security Review 2017

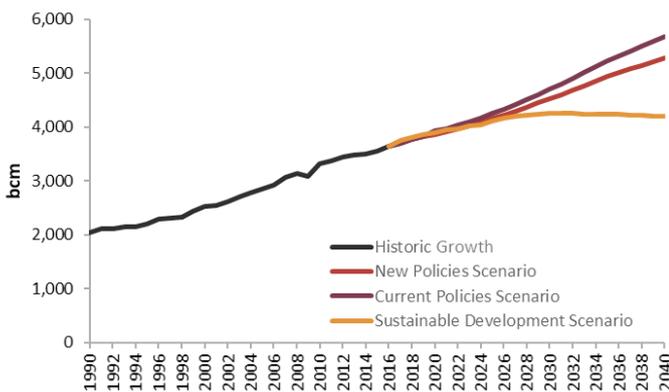
⁵ IEA – World Energy Outlook 2017



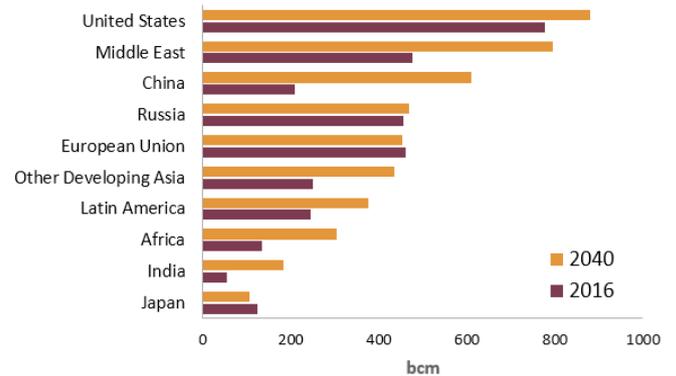
Total Liquefaction Capacity by Country⁶



Global Natural Gas Demand by Scenario⁷



Gas Demand Expectations in Selected Regions⁸



C. Role of Natural Gas in Turkish Energy Sector

1. Natural Gas in Total Primary Energy Supply and Demand

In parallel with economic and population growth, energy consumption of Turkey has also increased significantly during the last decade. The primary energy consumption of Turkey has reached to 145 mtoe as the end of 2017, which represents 3.4% increase on annual basis with respect to 2007 figures. Among all fuel types, natural gas consumption takes the first place in Turkey with 44.3 mtoe in 2017 which grew with a 3.9% CAGR during the last decade. Natural gas has an indispensable role for Turkey as a primary fuel source.

⁶ IGU 2018 World LNG Report

⁷ IEA – World Energy Outlook 2017

⁸ IEA – World Energy Outlook 2017 – New Policies Scenario



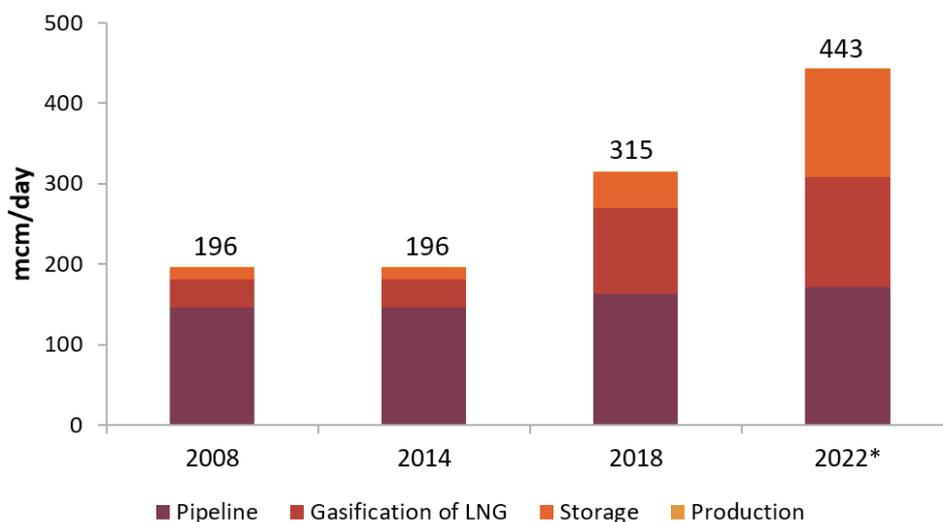
Turkey is an energy import dependent country, including natural gas. Its domestic natural gas production was only 0.35 bcm in 2017 accounting for only 0.7% of Turkish gas demand. Turkey's gas imports are provided by pipeline and LNG shipments. In 2017, 55.3 bcm of natural gas was imported by Turkey from 12 different countries, of which 53.9 bcm was consumed, 1.2 bcm put in storage and 0.6 bcm exported⁹. Turkey is the fourth largest natural gas consumer among European countries and sixteenth largest in the world¹⁰.

By the end of 2018, Turkey experienced shifts in the natural gas market. A weak spot market for power led to decreased production from Turkey's natural gas fired power plants. A weaker spark spread due to volatile gas prices, ending BO-BOT contracts with gas fired power generators from early 2000s caused a sharp decline in power generation related demand. Together with mild weather and relatively weak industrial activity, Turkey's annual gas demand resulted in an 8% shrinkage (to 50 bcm).

2. Turkey's Natural Gas Infrastructure

In order to accommodate Turkey's recent growth in natural gas use, a diversified import and domestic transmission infrastructure was built by BOTAŞ. There are five existing import pipelines and one is under construction. The entry points for the most recent pipelines also provide more flexibility in the domestic transportation of natural gas within Turkey. Added to these pipelines, there are two LNG regasification terminals and two floating storage regasification units (FSRUs). Aggregate natural gas withdrawal capacity has reached 316 mcm/day as a result of these investments¹¹. After the completion of TANAP, TurkStream, Saros FSRU and underground storage expansions, it is expected to exceed 400 mcm/day, significantly more than the maximum daily demand of 243 mcm reached in 2017¹². On an annual basis a weaker gas demand increase is expected with respect to its past due to Turkey's rapid expansion of renewable power and the expiration of current BO-BOT contracts for power generation. These contracts had created a baseline consumption independent of merchant dynamics based on spot market prices or demand.

Daily Natural Gas Withdrawal Capacity Development of Turkey¹³



⁹ 2017 Natural Gas Sector Market Report of EMRA

¹⁰ Enerdata.

¹¹ EXIST

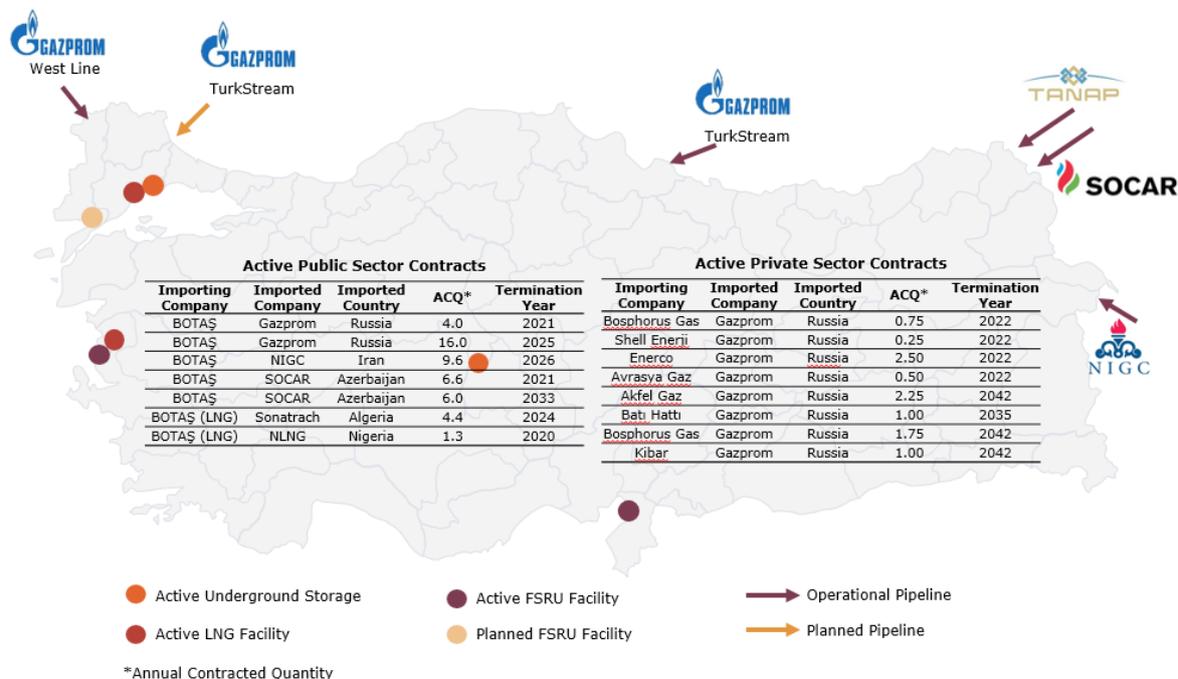
¹² MENR

¹³ EXIST, BOTAŞ

*BOTAŞ's projections are utilized for the year of 2022



Natural Gas Entry Points and Current Import Contracts of Turkey¹⁴



This large Turkish reserve gas capacity is an important resource to support the development of a Turkish natural gas hub notwithstanding that Turkey has little domestic gas production. This large reserve capacity, source diversity and transit links to Europe support the role of Turkey as a benchmark marketplace. Achieving a trading hub reference price within the Turkish gas system would provide significant benefits for Turkey and Europe. Less obviously, but equally important, it could also be beneficial to Turkey’s foreign suppliers. While selling natural gas into a competitively priced commodity market may not, at first, seem so attractive, the potential expansion of gas demand resulting from such an arrangement might more than compensate what might first appear to be a negative pricing environment.

3. Natural Gas in Power Generation

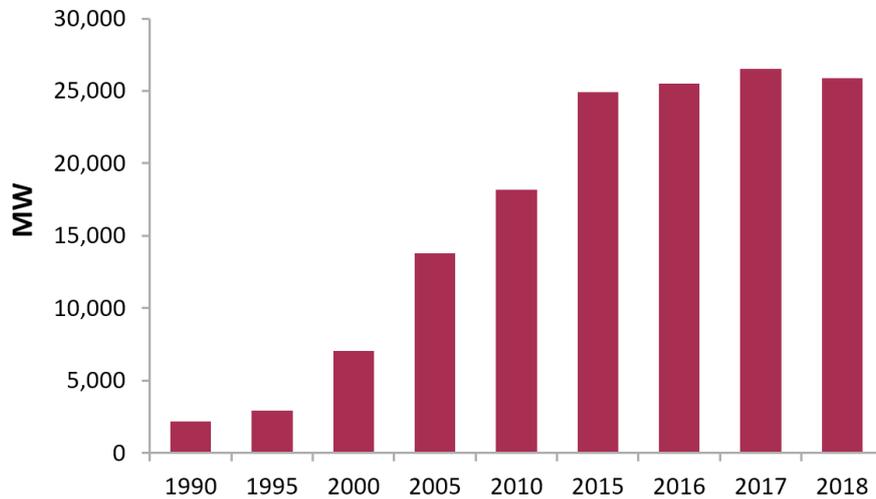
For Turkey, natural gas has a central place in terms of helping meet electricity demand. In order to keep up with the climbing electricity demand, before 2000s, Turkey used to invest for electricity supply sources through specific concessions or public enterprises, mostly in hydroelectric facilities and low calorific value lignite. Over the years, with the efforts for vertical unbundling and competition enhancement measures, heavy dominance of public entities was eased considerably through market mechanisms and private sector investments were both encouraged and incentivized to take part on the supply side. In such an environment, private sector investors made their investment decisions based on their prospective cost and benefit expectations. Natural gas, being a relatively cheaper and abundant resource thanks to long term pipeline contracts, and gas fired power plants being flexible in terms of deployment, operation, and financing, became a preferred choice of primary fuel for power generation.

More than 20 GW of natural gas fired plants have been commissioned since 2000 in Turkey, in parallel with fast growing electricity demand. As of end of 2018, 30% of the national installed capacity is comprised of gas fired plants. Likewise, natural gas plants growth in electricity generation grew from below 20% levels before 2000 to 48% in 2014. However, as discussed above, production from natural gas power plants has decreased to 38% and 30% in 2017 and 2018 respectively, due to increasing natural gas costs and decreasing spark spreads.

¹⁴ BOTAŞ, EXIST



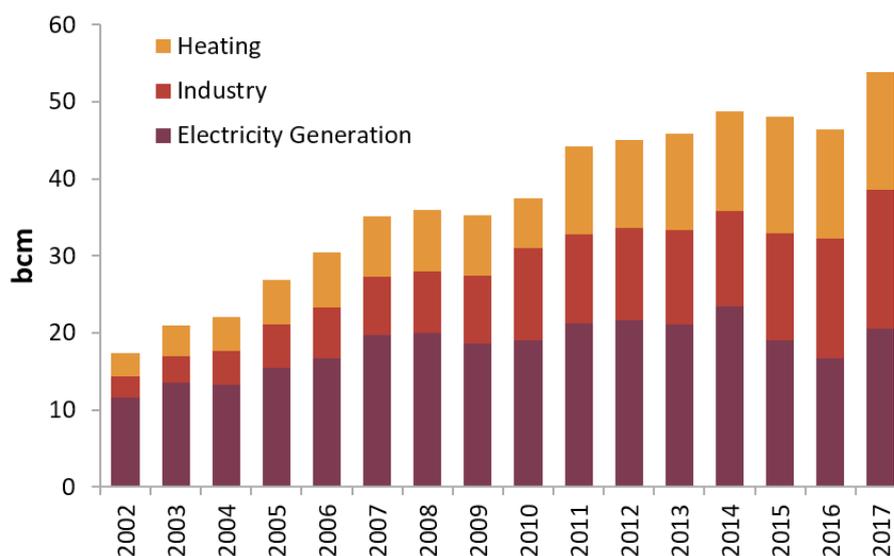
Installed Capacity Development of Natural Gas Fired Power Plants¹⁵



4. Natural Gas in Industry and Buildings

In addition to its growing importance in power generation, natural gas also became a much more important factor in the residential and industrial sectors during the last 2 decades and, combined, now account for significantly more gas consumption than in the power sector.

Natural Gas Demand Development Breakdown by Sector, 2002-2017¹⁶



¹⁵ TEİAŞ

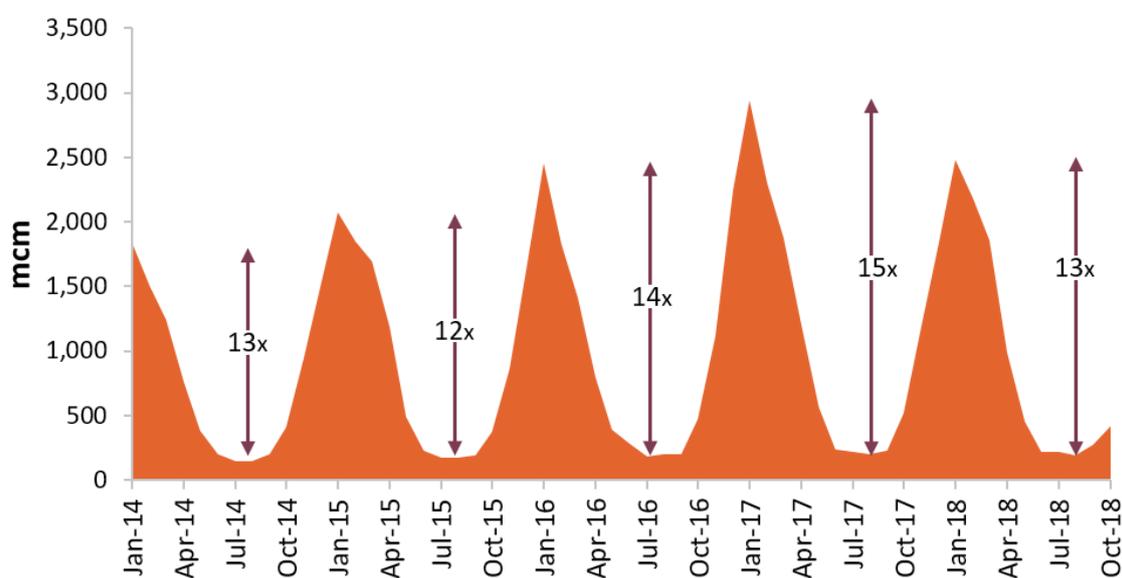
¹⁶ Annual Natural Gas Sector Market Reports of EMRA



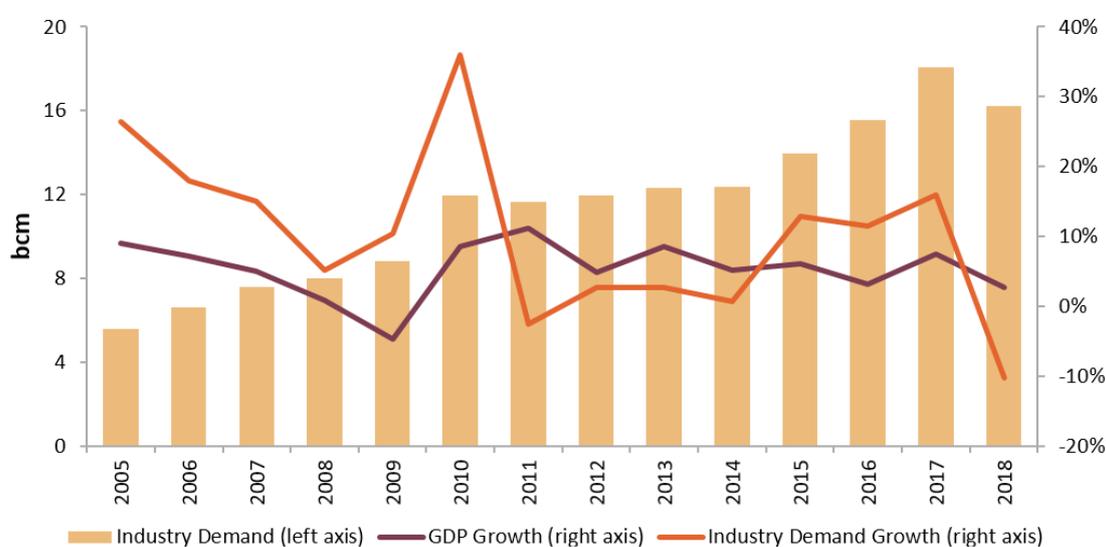
While there were only 6 cities supplied natural gas at the beginning of the decade, as the end of 2018, thanks to a well-regulated distribution tariff mechanism, all 81 cities are supplied with natural gas. Investments are continuing to permit further penetration of this versatile and clean-burning fuel for heating and industry. This is the main outcome of the successful distribution grid privatization program which increased network penetration and subscription rates for residential customers on the provincial level across the country. As natural gas is mainly used as a heating fuel; the residential demand is highly seasonal. Furthermore, the existing pricing policy for residential end users is far from being cost reflective, thus creates an impact on treasury and state controlled entities.

Gasification growth in industry since the early 2000s followed a similar trend although, as shown in the figure the growth in gas demand was highly dependent on GDP growth.

Monthly Residential Natural Gas Consumption in Turkey, 2014 – 2018¹⁷



Development of Turkish Natural Gas Demand in Industry, 2005 – 2018¹⁸



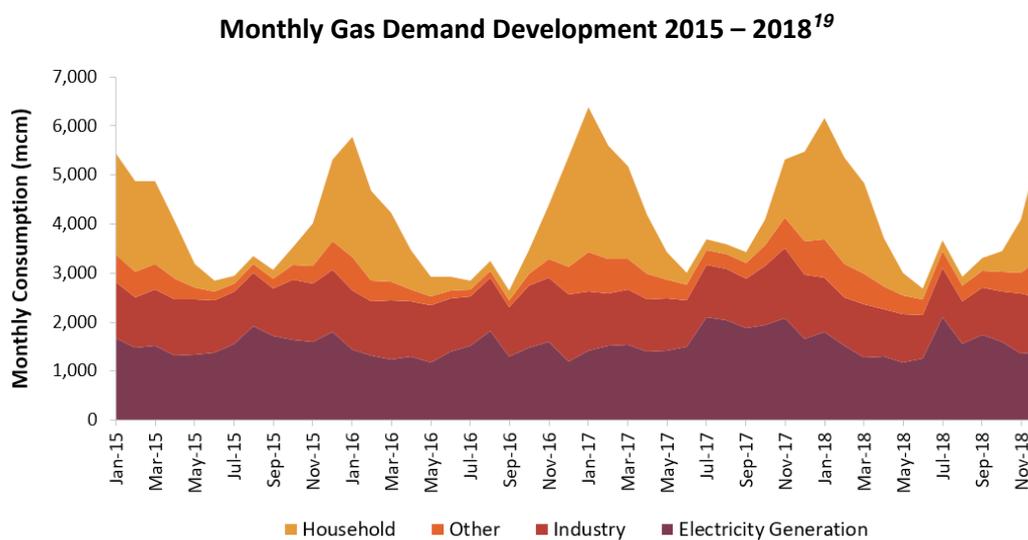
¹⁷ EMRA Monthly Reports

¹⁸ EMRA Yearly and Monthly Reports, TurkStat



5. Natural Gas Market Status

Natural gas consumption in Turkey has decreased by some 8% in 2018, and a demand decrease experienced in all of the main gas consuming sectors. Industry and electricity generation sectors were the main drivers by decreasing 10% and 12%, respectively. On the other hand, although consumption levels of households have been in a strong increasing trend on an annual basis in parallel with distribution investments, in 2018 household consumption was also decreased by %4.



Decreasing gas consumption levels also caused a decrease in natural gas imports. As a state-owned incumbent company, BOTAŞ undertakes more than 80% of Turkish gas imports while remaining import is realized by private sector players through Malkoçlar entry point as pipeline gas. A small percentage of private imports was via a regasification facility as LNG. Historically, most of the private sector imports had been done via Malkoçlar entry point since private sector's LNG imports was below 1% of total gas imports of Turkey²⁰.

Due to decreasing profit margins, private sector players decreased their import volumes to 7.7 bcm in 2018 which is the lowest amount since 2014 (7.9 bcm). Private sector imports continue to decrease with 2019 Q1 imports being less than 1.1 bcm. ²¹This dramatic decline reflects an ongoing dispute around the price levels with Gazprom. While this topic may deserve a paper on its own to fully explore, briefly put, private importers are having a tough time due to their gas import prices being above the marketable price in Turkey. Having lost an arbitration case against Gazprom regarding 2017 and 2018 prices²², the future of private sector contracts with Gazprom is difficult to predict without additional flexibility on Gazprom's part as well as higher domestic natural gas prices.

¹⁹ EMRA Monthly Natural Gas Market Reports

²⁰ EMRA Monthly Natural Gas Market Reports

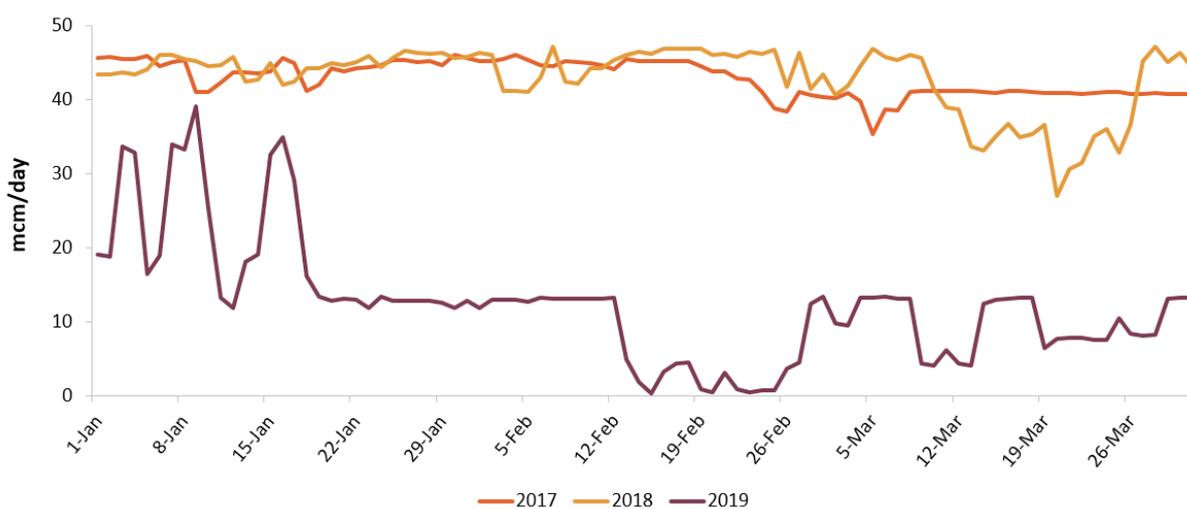
²¹ Bulgartransgaz – Please also note that the volumes are the total of BOTAŞ and Private sector off-takes from Malkoçlar entry point.

²² The arbitration decision is about the cancellation of a 10.25% discount over prices in 2017 and 2018. The decision(s) award ~400mUSD to Gazprom in retrospective transactions, but it is not clear how such a settlement will be achieved with private imports completely halted. As of the publishing date of this paper, the situation has created a huge stalemate among parties that has deadlocked progress for contract revision negotiations. The private importers are also poised for an even larger take-or-pay penalty due to the decreased imports while Gazprom has lost considerable current revenue.

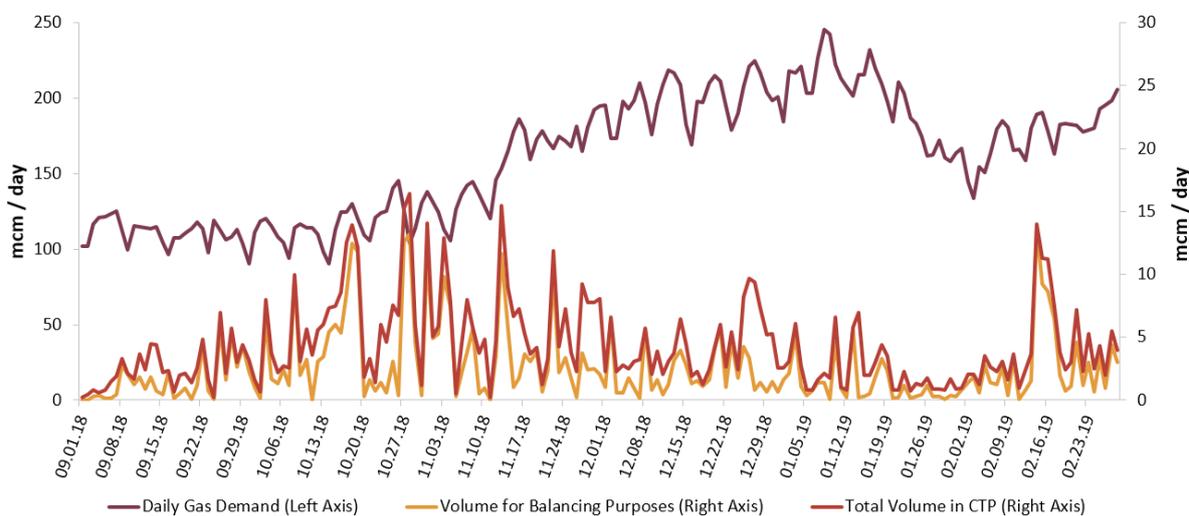


Apart from the decreasing private sector players' import volumes, a Continuous Trading Platform (CTP) has established under EPIAŞ's management in Turkey in order to increase competition and create liquidity in Turkish Gas Market. However, volumes of the organized market remains at low levels at its initial phase. According to first six months figures, only 0.75 bcm gas has been traded in CTP which corresponds to 4.3 mcm/day (2.7% of average daily gas demand). Moreover, more than 60% of the volume was realized for balancing purposes due to BOTAŞ's TSO operations.

Daily Off-Take Volumes at Malkoçlar Entry Point in the Q1, 2017 - 2019²³



Daily Volume Analysis of CTP, September 2018 – February 2019²⁴



Turkish gas prices reflect the pricing methodology of BOTAŞ. Even though BOTAŞ's natural gas import costs are not known publicly, BOTAŞ has long term gas import contracts with oil-linked pricing.²⁵ Since long term contracts constitute more than 40 bcma of volume, Turkey's gas costs may reflect the dynamics of the oil market more than the dynamics of other regional gas markets. Combined with "take-or-pay" obligations common to such contracts, Turkish gas costs appear to be above typical European costs.

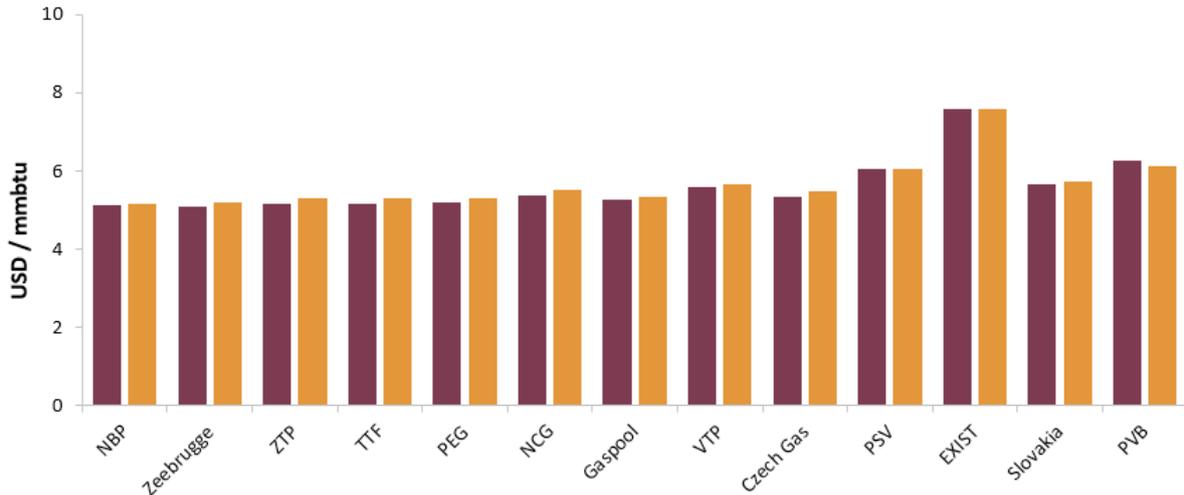
²³ Bulgartransgaz

²⁴ MENR, EPIAŞ

²⁵ G. Rzyeva, OIES, January 2018



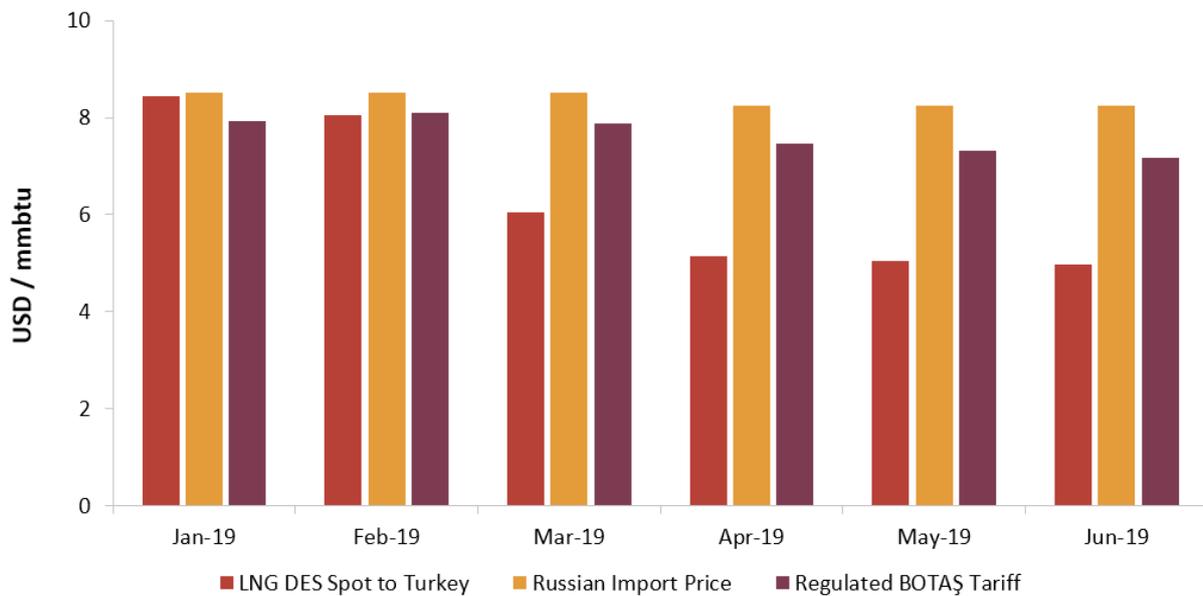
European Day-Ahead Gas Prices: Day Ahead vs Previous Day (April 2019)²⁶



*Euro/Usd conversion rate taken as 1.13

For domestic sales, BOTAŞ applies different pricing policies for households, industries and electricity generators. Households benefit from subsidized prices which are around 35% lower compared to industrial consumers who pay approximately 15% less than the power generation companies.²⁷ The prices are above European hub prices and BOTAŞ appears to be facing higher costs from its oil-indexed import prices according to ICIS data.

Comparison of Turkish LNG, Russian Pipeline Prices and Regulated BOTAŞ Tariff to Gas Fired Power Plants²⁸



²⁶ ICIS

²⁷ As of May 2019, with a TL/USD exchange rate of 6.06, the power, industrial, and residential sales prices for BOTAŞ are 7.04, 6.13, and 4.04 USD/mmBtu consecutively.

²⁸ ICIS



With low LNG spot prices, an LNG importer can benefit from the price differences in domestic and global gas markets. However, this business opportunity entails some risk as BOTAŞ announces its sales prices monthly at the last day of the previous month. LNG importers are not able to know the gas market price, even a month beforehand.

Because BOTAŞ is the counterparty to the vast majority of all long-term important contracts and has responsibility to maintain energy prices that encourage economic activity and protect consumers, a necessary consequence appears to be reduced private sector liquidity in Turkish gas market. Meeting BOTAŞ's several policy objectives while also encouraging increased private sector participation in the market appear to be, at times, incompatible. It is also apparent that with low private sector volumes, the CTP does not provide an opportunity for significant private sector participation let alone serve as a market pricing point reflecting the market balance of many private buyers, sellers and non-commercial traders. The existence of one entity that has an outsized impact on supply or demand on a platform seems to prevent it from achieving that outcome. Another disadvantage is that potential energy efficiency gains are not effectively utilized sufficiently across all gas consuming sectors since the end user prices are not reflecting the real cost of gas as a commodity.

D. What is a Gas Trading Hub?

A natural gas hub is a platform in which natural gas can be traded by both adequate number of buyers and sellers at fair prices in a reliable environment. Hubs creates a huge advantage for a market since it represents rational and competitive price formation by bulk of players rather than an opaque price determination of bilateral agreements. Therefore, a well-functioning gas hub provides efficiency, transparency, clarity and predictability in the markets which supports the financial trade and risk management operations.²⁹

Gas trading hubs are classified as either virtual or physical hubs.

A virtual gas trading hub assumes the whole network has a single point in which gas is traded. The hubs that have the biggest market share in Europe, NBP and TTF, are the prominent examples for virtual natural gas hubs.³⁰

A physical hub is a large gas storage facility in a specific location or locations within a gas network that is interconnected to suppliers and customers and capable of closing natural gas contracts with physical sales and purchases with the hub serving as the point of delivery or purchase. A large physical hub, combined with a liquid commodity market for natural gas using the hub as the point of delivery can set spot natural gas prices as the result of the combined offers of producers, gas customers and non-commercial traders. Since the commodity market would offer futures contracts for the purchase or sale of natural gas at the hub, commercial parties could lock in future prices and achieve increase certainty for their business and investment decisions. Since actual buyers and sellers are typically too few in number to establish stable prices, commodity markets achieve relative price stability through the participation of non-commercial traders. The most prominent example of such a gas hub is Henry Hub in Louisiana, United States which has the largest market volume. Nonetheless, despite the extensive U.S. gas distribution infrastructure, other pricing hubs exist in the United States to better reflect regional supply and demand.

The raison d'être for a Turkish gas hub is its physical infrastructure including Turkey's variety of import pipelines, LNG regasification terminals, storage investments, extensive distribution infrastructure, and interconnections between Asia and Europe. Consequently, when we speak of the potential for Turkey to establish a regional gas hub, the focus is for a physical hub as opposed to a virtual gas hub for which Turkey's considerable and unique attributes count for much less.

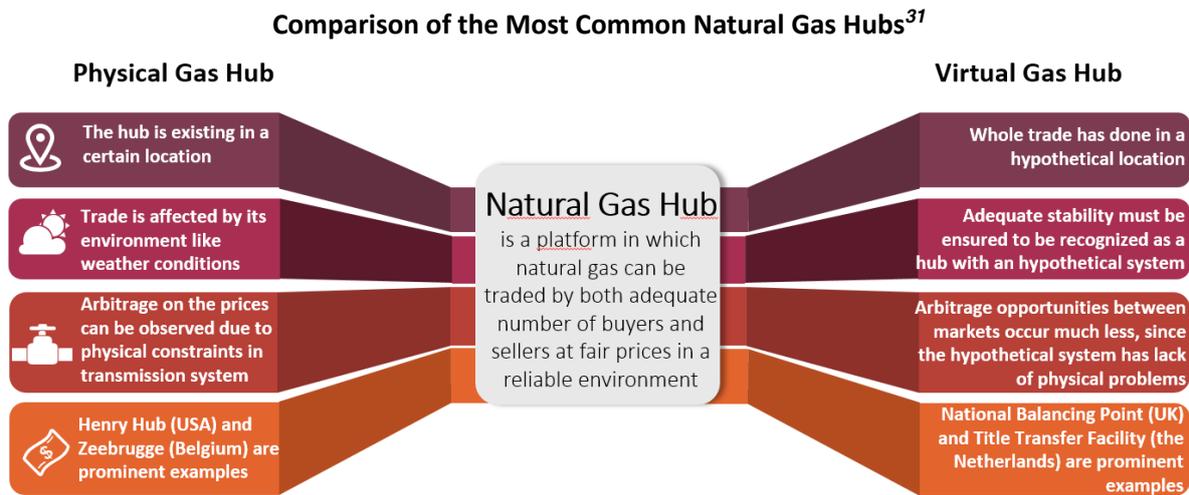
There are two well-known institutions, which evaluate the European gas markets through their own methodology, namely ACER and EFET. The Agency for the Cooperation of Energy Regulators (ACER), a European Union Agency, was created by the Third Energy Package (Directive 2009/73/EC) to further progress the completion of the internal energy market both for electricity and natural gas which was launched in 2011. The European Federation of Energy Traders (EFET), founded

²⁹ Turkish Competition Authority

³⁰ Key elements for functioning gas hubs: A case study of East Asia, Shi et al.



in 1999, is an association of European energy traders operational in both power and gas market, and aims to promote competition, transparency and open access in the European energy sector. The metrics used by each association will be used later in the paper to evaluate of Turkey's potential to serve as a natural gas hub and trading center.



E. Potential Benefits of a Regional Gas Hub in Turkey

1. Why is it beneficial for Turkey?

i. Energy Security Objectives

Turkish electricity demand rapidly grew between 2000 and 2017 with 4.9% annual growth over that period. This rapid growth placed a strain on Turkey's infrastructure, especially in the early 2000's and around 2010. The installed power generation capacity was not adequate to meet the increasing demand and there was a potential for blackouts. Consequently, several natural gas fired plants were deployed initially under a concessionary mechanism with offtake guarantees and then later driven by the merchant price references. More than 20 GW additional natural gas fired power plants were commissioned since 2000 and these power plants helped create a significant amount of reserve margin to provide more reliable power supply.

In 2017, ca 38% of the Turkish electricity demand was met by natural gas fired plants, a relatively stable figure as these plants have undertaken on average 40% of Turkish electricity generation since 2013³². Although, utilization of natural gas fired power plants depends on other variables such on renewable generation profiles and hydrology, the availability of these plants ensure system security and are essential to manage possible transmission line congestions thanks to their flexibility.

Electrical supply security requires that supply capacity should always exceed demand. Reserve margins are the prominent indicators to assess system security. For daily analysis, reserve margin can be formulated as;

$$\text{Reserve Margin} = 1 - \frac{\text{Dail Peak Demand}}{\text{Available Installed Capacity}}$$

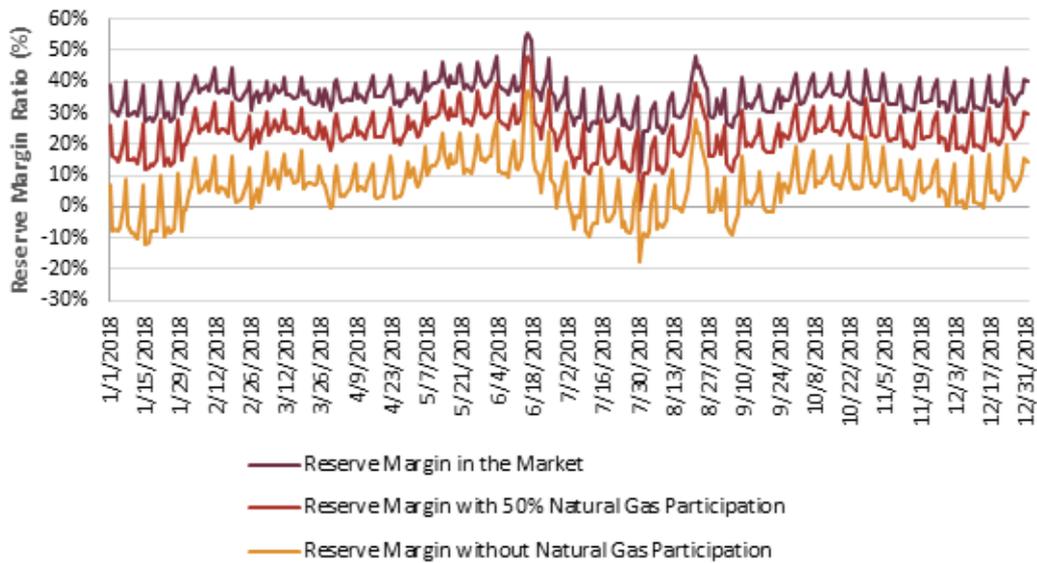
³¹ Developing a Natural Gas Trading Hub in Asia, IEA

³² Annual Natural Gas Sector Market Reports of EMRA



In Turkey, daily reserve margin levels were over 25% for almost all over the year of 2018 and realized as 35% in average, so that a possibility of a supply shortage was minimal during this year. To illustrate this, if only 50% of the natural gas fired power plants were available in 2018, the daily reserve margin would have decreased to 23% in average. In such a case, risks for the system security would have been escalated, but whole system could still be defined as secure. On the other hand, if none of the natural gas fired power plants were active during 2018, daily reserve margin levels would have fallen to 6% on average and even negative in 73 days. Moreover, with increasing share of intermittent generation from wind and solar, natural gas fired plants will remain important for balancing and flexibility purposes. Therefore, it can be said that, natural gas fired power plants are necessary for Turkish electricity system security.

Daily Reserve Margin Levels in 2018³³



ii. Macro–Economy Related Benefits

As a result of this rapid deployment of natural gas plants, as well as the expansion of gas use in the household and industrial sectors, natural gas has taken a significant place among the imported commodities of Turkey. While Turkey's natural gas import prices are not disclosed, assessing the total energy bill of Turkey provides some insights as the role of gas in Turkey's current account deficit. For instance, in 2017, 45,581 toe natural gas was imported which corresponds to 37% of total energy imports of Turkey³⁴. Turkey's energy bill for 2018 was about 43 billion USD, marking a 5.5% share in the country's GDP for the same term³⁵. Approximately 90% of gas import contracts are believed to be indexed to oil prices while only 9% of gas imports are purchased from spot markets³⁶. Therefore, bargaining power of Turkey has been limited and, consequently, Turkey's current account deficit is tied to oil prices in two important ways: first to meet the country's transportation fuel needs and, second, albeit with a time lag, the effect of oil price changes on the cost of Turkey's natural gas.

³³ TEİAŞ, EXIST

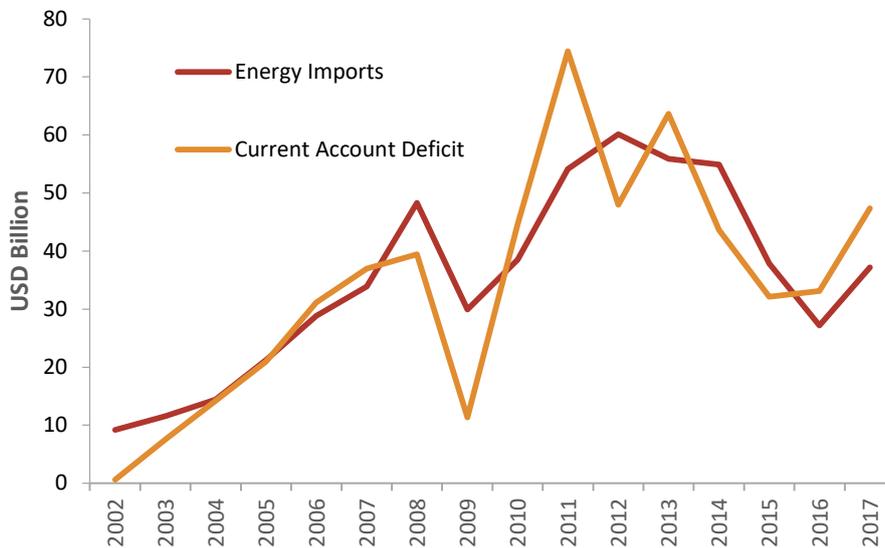
³⁴ MENR

³⁵ TurkStat

³⁶ Annual Natural Gas Sector Market Reports of EMRA, BOTAŞ



Current Account Deficit vs. Energy Import Bill of Turkey, 2002-2017³⁷



As Turkey’s future gas consumption will likely increase, even if it is moderated in the power sector, any opportunities to reduce its gas prices can positively affect Turkey’s long-term economic agenda. A competitive natural gas market could provide foundational advantages for the Turkish economy. Furthermore, improved competition would bring important efficiency gains.

iii. Environmental Performance

As of 2017, fossil fuels (oil, coal and natural gas) correspond to more than 80% of global primary energy consumption³⁸. Even though renewables emit far fewer green-house gases (GHG) than natural gas, fossil fuels are well established technologies that cannot be dispensed easily. As has been widely demonstrated, significant improvements in urban air quality and reduced GHG emissions have been achieved by moving from coal to natural gas fired power plants³⁹. Natural gas does not leave ash, odor and soot behind and it emits fewer harmful byproducts into the environment. For GHGs, natural gas produces 50% lower emissions than coal and 40% lower emissions than oil when used for power generation.

GHG Emissions of Fossil Fuel Fired Electricity Generation Technologies⁴⁰

	Natural Gas	Oil	Coal
Minimum	290	510	675
25th Percentile	422	722	877
50th Percentile	469	840	1001
75th Percentile	548	907	1130
Maximum	930	1170	1689

³⁷ TurkStat

³⁸ BP Statistical Review of World Energy 2018.

³⁹ IEA

⁴⁰ Renewable Energy Sources and Climate Change Mitigation Report of IPCC



Thanks to developing an extensive natural gas distribution network Turkey has been steadily moving to natural gas from coal over the last two decades particularly in residential use. For instance, in 1996, Turkish Authorities took emergency measures since air pollution level in Ankara reached the “danger level”. As a result, schools were closed and some restrictions were imposed on the use of private cars, central heating and coal stoves⁴¹. Due to such problems, Turkey increased the pace of network deployment of natural gas distribution infrastructure and all 81 city centers reached natural gas

Furthermore, natural gas provides flexibility, especially on electricity generation. Power demand is not always stable and since electricity cannot yet be economically stored in large amounts, a robust power infrastructure needs operationally flexible resources such as hydroelectricity power plants (with adequate reservoirs) and reserve natural gas fired power plants (with a gas supply and distribution network that can provide additional gas supplies when needed). Especially in peak demand periods utilities with a shorter response time, switch to gas to help meet demand. Among the peaker utilities, natural gas fired power plants come on line as the most important alternative.

Comparison of Prominent Peaker Facilities⁴²

	Natural Gas	Hydroelectricity with Reservoir	Battery Storage
Rapid Deployment	●	○	●
Capital Expenditure	●	◐	○
Allocation of Land	◑	◐	●
Generation Capacity	◑	◐	○

iv. New Services and Other Value Add from a New Business in Turkey

A gas trading hub could provide thousands of new jobs. A well-functioning trading marketplace requires services from a wide support array from consulting to information technologies, from finance to legal and much more. Once a functioning hub is created, the marginal cost of adding market participants to that hub is close to zero. But each new market participant creates demand for office space for commodity traders and data science professionals. Trading focused businesses especially require finance and legal support. Expertise gained in these areas can benefit other trading focused businesses in Turkey.

⁴¹ <https://www.nytimes.com/1982/01/12/world/ankara-takes-emergency-steps-as-pollution-reaches-danger-level.html>

⁴² MNM Consulting Analysis



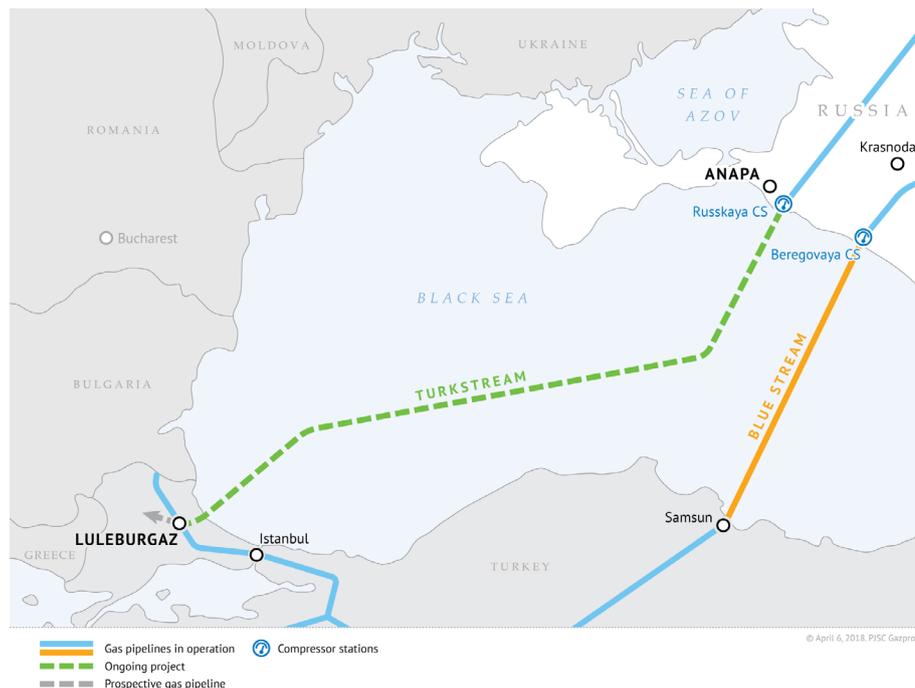
2. Why a Turkish Hub is Beneficial for Turkey's Natural Gas Suppliers

i. Rebranding Gas Molecules

Russia aims to sell more gas to Europe since it has an abundant amount of gas reserves and production capacity, and Europe is the nearest and richest region for Russia. Apart from the Nord Stream I pipeline which transports gas through Baltic Sea, the South Stream pipeline project has arisen after natural gas disputes was experienced between Gazprom (state-owned Russian gas company) and Ukraine. On July 2007, South Stream project was announced which is planned to transport gas to Europe by shutting off the gas flow through Ukraine.

However, the project was not fit for the "Third Energy Package" (Directive 2009/73/EC) of EU which includes the requirements for guaranteeing third party access and unbundling ownership from suppliers. Although Russia had attempts to get exemptions from the European Union, the Union refused to grant these exemptions. As result, Russia was constrained to shelve the South Stream project and start to look for other possible opportunities to sell natural gas. After Russia was ensured that South Stream pipeline is not implementable, they focused on the TurkStream project - which will transport gas to Europe through Turkey – starting from 2016 even though there were a political turmoil between Turkey and Russia.

Map of TurkStream Pipeline Project⁴³



European countries are more economically integrated with each other than with Russia and Middle Eastern countries which possesses ca. 70% of natural gas reserves globally⁴⁴. After the initial surge of North Sea supplies, Europe has had to be increasingly reliant on Russian, North African and Middle Eastern suppliers. However, to supply natural gas at more affordable prices, European countries are dependent to these countries even though the geopolitical situation among these regions may be volatile. Economic integration of Europe was highly driven by the European Union causing the dissolution of state monopolies and market mechanisms operating across borders. With this, European countries are bound by directives determined by the European Commission. For instance, although South Europe needs Russian gas, South Stream project was cancelled in consideration of the "Third Energy Package" (Directive 2009/73/EC) due to requirements on unbundling of supply and transmission entities. In that glance, Turkey became a strong candidate for European countries to supply natural gas.

⁴³ <http://www.gazprom.com/projects/turk-stream/>

⁴⁴ IEA Natural Gas Information 2018



A significant amount of pipeline capacity has already been constructed in Turkey between Russia and Iran. Moreover, Turkey will have redundant gas capacity in the near future as explained earlier parts of this paper, so that Turkey will be eager to sell its excess imports to Europe. By purchasing gas from Middle East, Azerbaijan, and Russia, Turkey could de-nationalize the natural gas and help diffuse the EU’s political opposition from regional gas supplies transiting to Europe. The primary objection to high European dependence on, for example, Russian gas, is bound up with fears of the geopolitical leverage given to a single supplier. If Russian gas, along with gas from other supplier countries is being commercially traded in a transparent trading hub, the concerns about geopolitical leverage substantially diminish since no single country can control the commercial operations of the hub. The hub effectively requires all supplier countries to function as commercial entities rather than as state actors.

For this and other reasons, a Turkish gas hub would ease the gas supply management of Europe – especially southern region – since companies can easily buy and sell the de-nationalized gas in Turkish gas market. In this regard, gas producer countries can sell more gas while European countries secure their supply and purchase gas in a more competitive gas market, and Turkey will create a churn within its borders and will easily manage its long term gas purchase contracts.

Termination of Long Term Natural Gas Contracts by Country⁴⁵

Importing Company	Imported Country	Annual Contracted Quantity (bcm)	License Termination Year
BOTAŞ	Russia	4	2021
BOTAŞ	Russia(TurkStream)	15.75	N/A
BOTAŞ	Russia	16	2025
BOTAŞ	Iran	9.6	2026
BOTAŞ	Azerbaijan	6.6	2021
BOTAŞ	Azerbaijan (TANAP)	6	2033
BOTAŞ (LNG)	Algeria	4.4	2024
BOTAŞ (LNG)	Nigeria	1.3	2021
Private Sector	Russia	4	2022
Private Sector	Russia	1	2035
Private Sector	Russia	5	2042

ii. Resources and Suppliers in the Region

In terms of European supply, pipeline gas has a crucial role and Turkey is located on the Europe’s south eastern supply node. Gas from Middle East, Azerbaijan and Turkmenistan can be supplied to Europe through Turkey. While the dominance of Russia is felt throughout the entire value chain across Europe, it reflects the large Russian supply and its pipeline infrastructure that enables it to supply Europe with most of its natural gas. This is reflective of the distribution of world natural gas resources within Europe, Asia and the Middle East, the main distorting factors come from oil indexed pricing and the absence of common carrier pipelines that prevent market based gas pricing based on the fundamentals of the natural gas market.

A Turkish physical natural gas hub and exchange could offer Europe a gas supply chain in which Russian gas, along with other significant sources of natural gas (from Caspian, Middle East and other pipelines as well as re-gasified LNG and in the future, potentially from East Med), would be competitively priced with transparent price discovery reflecting market fundamentals of supply and demand. Achieving this would require significant contract negotiations and restructuring. Destination clauses would have to be eliminated and some of the take or pay limitations eased. Obviously, these are not likely to be overnight changes. If accomplished, they would more likely result from a series of evolutionary developments.

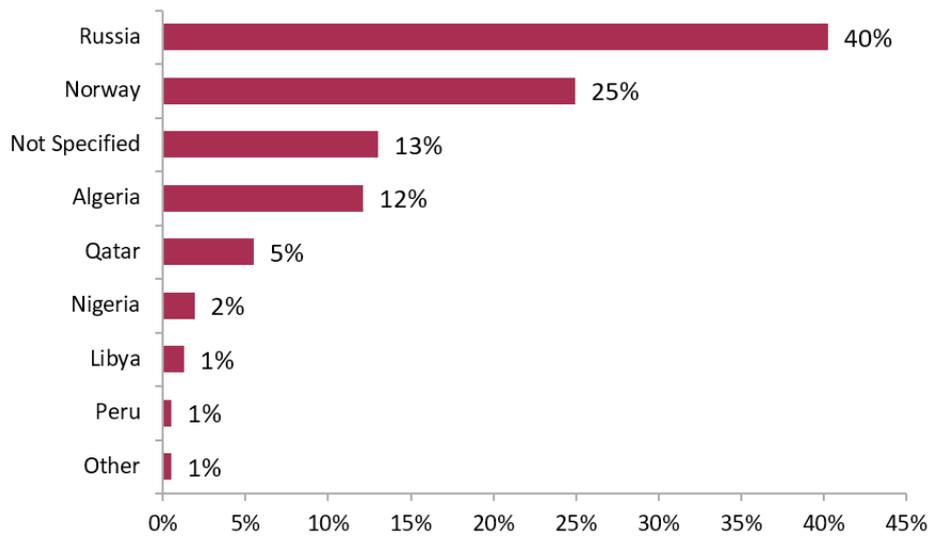
Turkey’s increased LNG gasification capacity, TANAP and the Turk Stream pipeline are channeling more gas into the Turkish system. With TurkStream replacing the West Line and, reversals on the West Line could help provide the currently

⁴⁵ BOTAŞ, EMRA

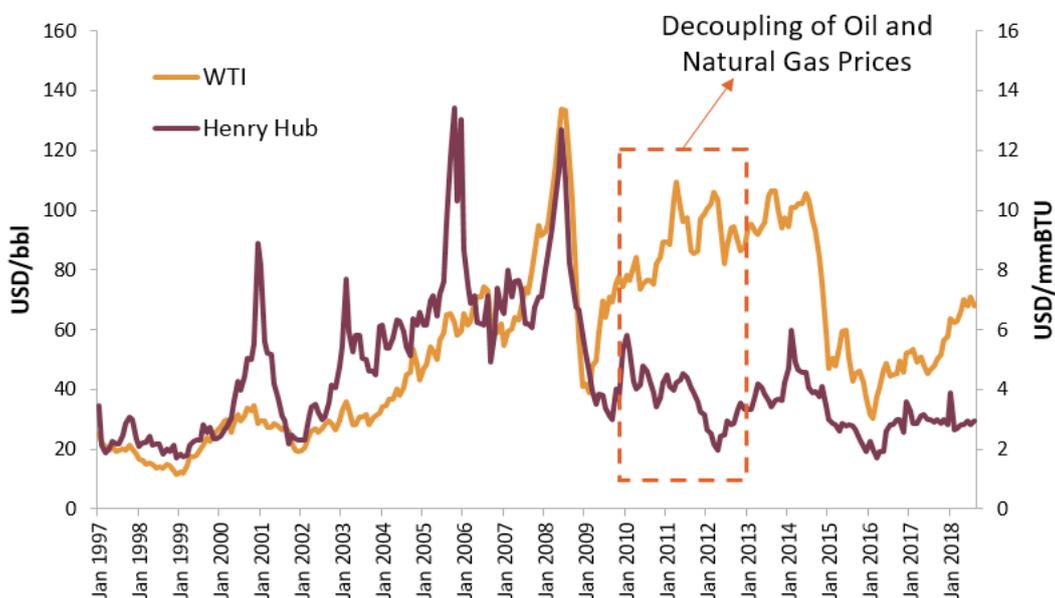


missing export capacity into Europe. This opportunity is further supported with the strengthening of the gas infrastructure of Balkan countries in parallel with Central and South-Eastern Europe Energy Connectivity (CESEC) projects which are supported by European Union.

Natural Gas Imports of European Union by Country*, 2016⁴⁶



Decoupling of Oil and Natural Gas Prices⁴⁷



A regulatory environment that both enables and encourages domestic and foreign players to take part in trade and access infrastructure is essential to establish a gas hub. These conditions cannot be achieved if a single market actor, whether government or private, is able to set prices through its purchases or sales. Regardless of whether these purchases or sales

⁴⁶ European Commission Statistical Pocketbook 2018

* From non-EU suppliers and as a share of total non-EU imports.

⁴⁷ U.S. Energy Information Administration. Henry Hub may seem an irrelevant choice of market to the context of this paper, however, we believe it is a good choice as to the liquidity and depth of both gas and oil markets and the potential transition between them. Furthermore, although not shown here, European markets have similar behaviour.

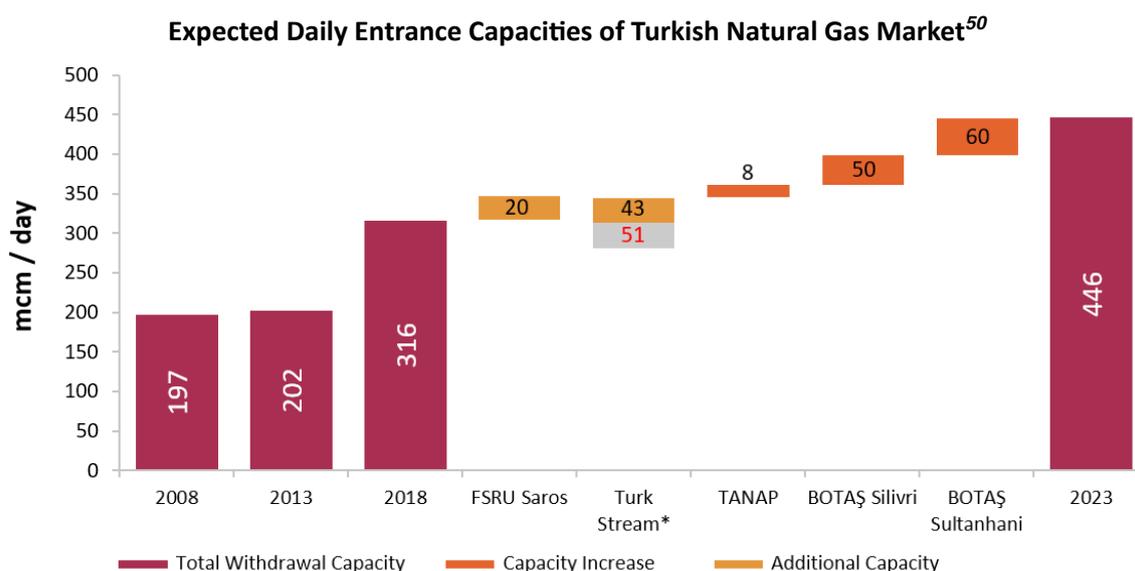


would be motivated by an intent to affect market prices or for some other purpose, the market risk to non-commercial traders is too great in order to expect the evolution of a liquid commodity market. Market participants also need predictability to facilitate trust in the regulatory agencies not to intervene when prices go against local interests for example due to dynamics in the regional gas markets. To show its willingness to become a natural gas hub, in September 2018, a spot natural gas market (CTP) was launched under EXIST, Turkish Independent Energy Exchange.

iii. Increased Exports

During the last decade, the adequacy of Turkish gas infrastructure was tested frequently on cold winter days. Despite the fact that annual capacities of Turkey's international contracts were adequate to meet annual gas demand, with cold weather triggering heating related gas demand, peak consumption exceeded peak supply occasionally, creating temporary deficit. This deficit was often managed via line-pack, using the pipeline infrastructure as a medium of storage via over pressuring or under pressuring the system. In several instances, the line-pack was not enough, triggering obligatory curtailments for industrial consumers, starting with gas fired power generation facilities. However, since Turkish power demand needed this gas fired power generation capacity, electricity prices were affected significantly by these curtailments.

Starting from 2016, Turkish policy makers has focused to increase the daily gas intake capacity and important steps has been taken such as commissioning of two FSRUs (Floating Storage Regasification Unit), expansion of LNG regasification facilities, and completion of TANAP. In line with these infrastructure investments daily withdrawal capacity has reached to 316 mcm, which is 30% above the historic maximum daily gas demand of Turkey⁴⁸. The importance of a large reserve regasification capacity, through excess regasification capacity, to Turkey's energy security cannot be overemphasized. It is also in line with the significant expansion of spot LNG trade mentioned earlier. Spot LNG purchases re-gasified through this capacity provides Turkey with significant reserve gas supply capacity. Furthermore, projects to increase daily withdrawal capacity are still ongoing, such as Turk Stream, expansion of underground gas storages and an additional FSRU facility. After the completion of these projects, Turkey's daily withdrawal capacity is expected to reach up to 446 mcm⁴⁹. Therefore, in the medium term, Turkey is on route to have more entry capacity than it can utilize and finding new markets to utilize this excess capacity and finding the gas to fill in this capacity has a strong rationale for both Turkey and its gas suppliers. Furthermore, establishing a natural gas hub would create market based price signals and promote market activity, number of players, liquidity and depth.



* Turk Stream is expected to be substituted with West Line pipeline.

⁴⁸ EXIST, MENR

⁴⁹ EXIST, BOTAŞ

⁵⁰ BOTAŞ, EXIST



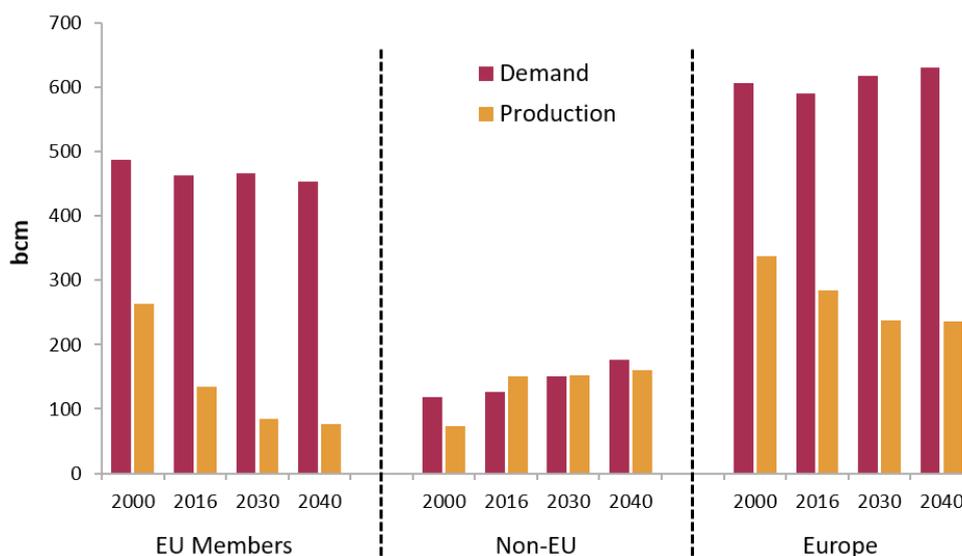
iv. More Demand is Better than Restrictive Contracts

During the last 2 decades, in parallel with industrialization, population growth and increased economic activity, Turkey has experienced a significant growth on natural gas demand. Although Turkey's gas demand is expected to increase, mainly due to increased demand outside the power sector, its import capacity will likely remain much higher than its demand, therefore gas suppliers of Turkey, as well as gas importers with take or pay obligations, can benefit greatly from possibility of alternative destinations to market their gas. Regions in south, north and east side of Turkey are gas producer countries so that Europe is the obvious target market. Developments in continental Europe, mainly gas demand picking up, support this case. In addition, improving infrastructure penetration especially in Southeastern Europe is creating opportunities. Balkan countries like Bulgaria, Romania are expected to strengthen the natural gas infrastructure in the near future with the support of European Union⁵¹. According to IEA, demand of European Union Member countries will stagnate but the gas production of the EU Members is expected to be halved by 2040, creating a playing ground for imported gas. Furthermore, the gas demand of European countries which are not a member of EU is expected to increase by 40% as of 2040 while their production is expected to stagnate⁵², both developments creating a strong case for additional gas volumes to be marketed in Europe.

It is known that long term pipeline contracts include some restrictive take-or-pay obligations for off-taker countries, so that these countries should either secure their future gas demand or pay for unused gas. In Turkey's case, gas demand is expected to increase, however it still may not be enough to purchase all of the volumes in its long term agreements, from both demand perspective and physical capacity perspective as the entry capacity is fixed whereas demand is highly volatile. Therefore, elimination of the restrictive destination clauses in these contracts would help expand the market base and trigger bigger volumes in trade.

From this perspective, natural gas suppliers of Turkey will also benefit from a potential gas hub (and the contract and regulatory changes that would be necessary to create one), since not only demand increase is expected in Turkey but also import requirement of European countries will increase, so that they will ensure to sell their increasing gas production.

Natural Gas Demand and Production Development of Europe⁵³



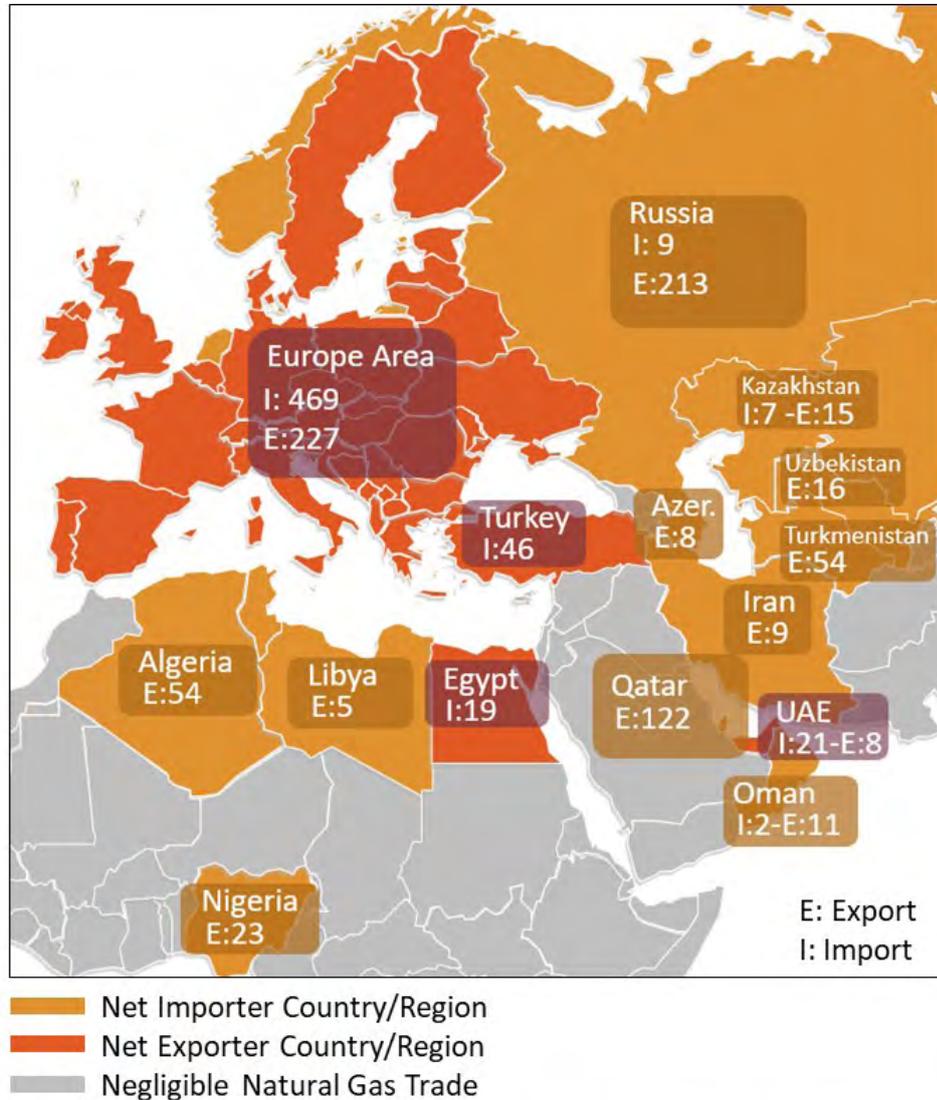
⁵¹ CESEC Projects

⁵² IEA – World Energy Outlook 2017 – New Policies Scenario

⁵³ IEA – World Energy Outlook 2017 – New Policies Scenario



Indicative Map of Natural Gas Supply & Demand Nodes⁵⁴



*All figures are in bcm and only values above 1 bcm are illustrated

v. Hedging and risk management by means of a liquid growth market

Commodity trading business have always been at the forefront of the management of price risks. Eventually, risk management is a dominant aspect in contemporary markets. As markets develop and expand, the need for cautious, effective and intelligent risk management increases. As part of risk management, commodity trading business use tools of hedging widely to ensure against financial risks via taking an offsetting position to another one in a commodity. Hedging may aim to fix consistent and stable cash flows, to fix the price, or to reduce positional exposure. With wider access to different markets and different trading tools, and boosted liquidity and depth in those markets, participants can aim to have a better arsenal to manage ambiguity. A well-functioning Turkish hub will definitely add to that arsenal via both physical demand and trading liquidity.

⁵⁴ IEA

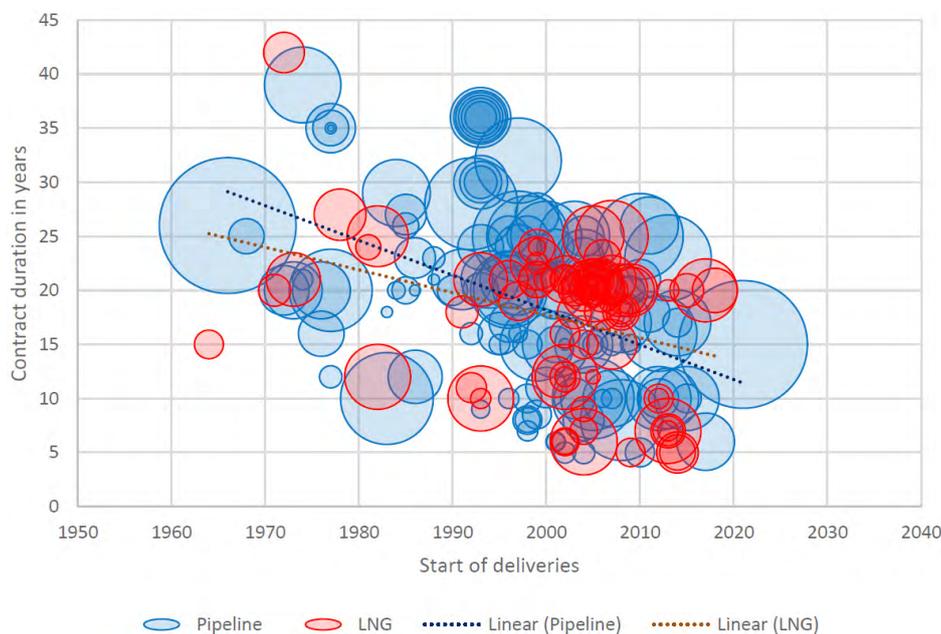


3. Why a Turkish Hub is Beneficial for Demanding Markets?

i. Increased competition in European Gas Markets

As stated above in this study natural gas demand across European Union is expected to stagnate in the long term. However, despite the stagnation of demand, import levels of EU member countries are expected to increase in parallel with decline in domestic gas production levels.⁵⁵

Contract duration by start-up year of deliveries of individual long- and mid-term commodity contracts in EU and Switzerland* ⁵⁶



Furthermore, the dominance of long term contracts signed by EU members are decreasing, since durations of the contracts signed in 80s and 90s is coming to an end and there is an apparent preference for more flexible terms; including hub-linked price formulas rather than the oil-linked formulas that were applied in the past. As a recent example; hub-linked contracts have been signed between European buyers and Statoil, Sonatrach and TAP⁵⁷. European gas importer countries have gained more competition power with increasing supply source options, these countries prefer to have hub linked gas price contracts which brings more competition into the market.

European countries could significantly benefit from a natural gas hub in Turkey, since their gas import levels are forecasted to increase and a well-functioning gas hub will naturally help with gas to gas competition and therefore more favorable terms. In addition, given the pipeline infrastructure in Europe, any physical gas and trading hub in Europe, outside of Turkey, would not likely have the same volume of gas supplies from a large variety of countries as would Turkey's hub, especially as North Sea resources become less important. A new game for natural gas has shaped in Europe and the players should be ready for a strong competition as it is stated in the European Commission's Quo Vadis Report: "If producers want to secure long-term delivery contracts as hedge for their long-term production and investments, they must adapt to the new market conditions in the EU."⁵⁸

⁵⁵ IEA

⁵⁶ European Commission - Quo vadis EU gas market regulatory framework

* The size of the circle corresponds to the size of the annual volume of the closed contact

⁵⁷ European Commission - Quo vadis EU gas market regulatory framework

⁵⁸ European Commission - Quo vadis EU gas market regulatory framework



ii. Increased availability and flexibility of Gas in SEE

There is a strong gas infrastructure network in the continental Europe, however, Southeastern part of the Europe needs more infrastructural investments in order to integrate with both southeastern countries and western part of the Europe. As result of weak infrastructural development, countries in the Southeastern Europe must cope with the problem related with the competition, integration and supply security.

Gas Infrastructure of Europe⁵⁹



As it can be observed in the map above, natural gas pipeline capacities are highly limited especially on the Adriatic side of the Southeastern Europe (Greece, Albania, Serbia, and others). Therefore, international pipelines must be constructed in parallel with inland developments to increase the integration with the rest of Europe.

On the other hand, countries like Bulgaria and Romania have larger transmission capacities; nonetheless, these countries are still highly dependent on Russia. In 2017, Bulgaria met 100% of its imports from Russia while this ratio realized as 99% for Romania⁶⁰. With Russia planning to eliminate Ukraine as a corridor country, the current pipeline will remain redundant after the completion of Turkish Stream pipeline. With necessary technical revisions, this may represent a significant opportunity to create an outflow corridor from the source rich Turkish Hub to Europe.

In order to help solve the integration problem of the region, Central and South Eastern Europe Energy Connectivity (CESEC) program was initiated which works to accelerate the integration of Central Eastern and Southeastern European gas and electricity markets which also supported by the European Commission. The EU and CESEC member countries were joined to nine Energy Community contracting countries; Ukraine, the Republic of Moldova, Serbia, the Former Yugoslav Republic of Macedonia, Albania, Bosnia and Herzegovina, Kosovo, Montenegro and Georgia⁶¹. Lastly, Turkey, Norway and Armenia have joined the Community as observer countries. Therefore, it can be said that countries in the Southeastern Europe has already set targets to increase their integration in natural gas sector and it is supported by European Union.

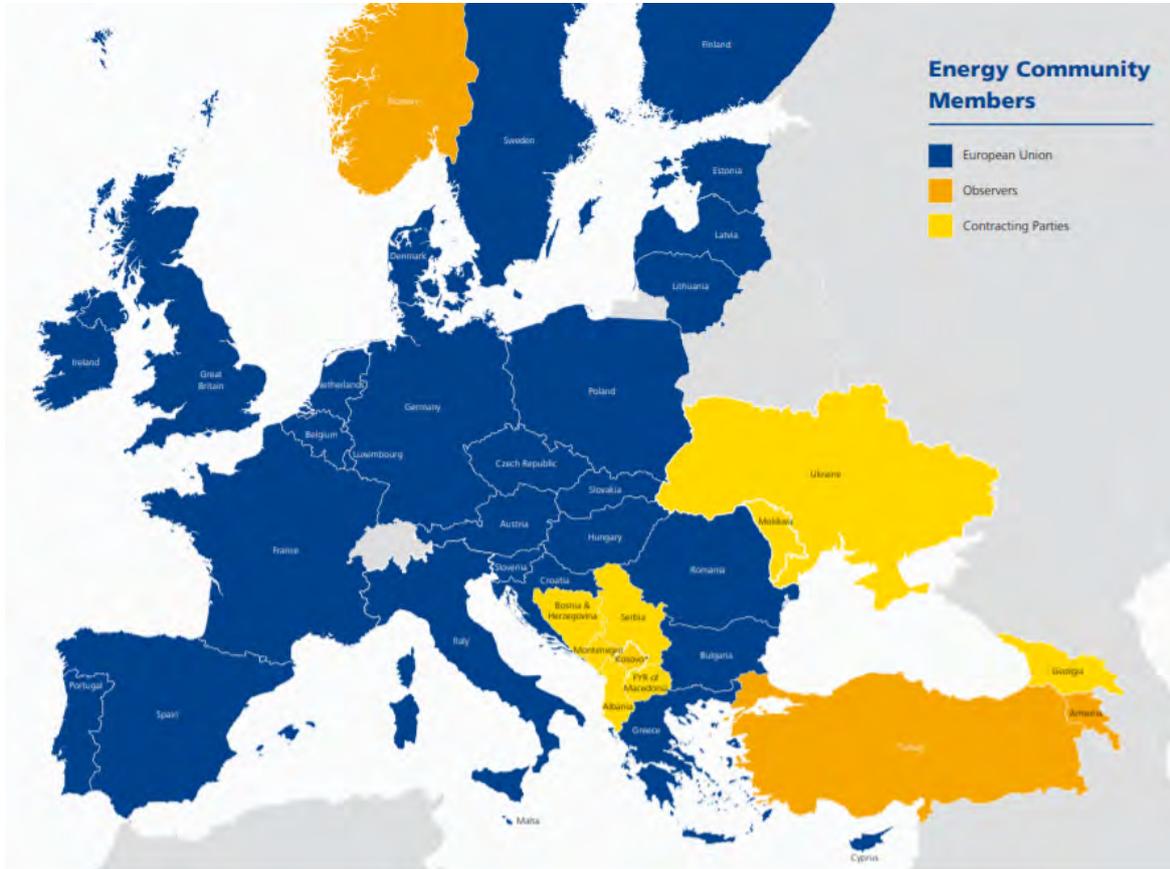
⁵⁹ ENTSO-G – The European Gas Network - 2017

⁶⁰ IEA – Natural Gas Information 2018

⁶¹ European Commission, Annual Implementation Report of Energy Community Secretariat - 2018



Member Countries of the Energy Community⁶²



In such an environment, Turkey has significant opportunities to establish a powerful natural gas hub to serve the purpose. Firstly, a high demand node, Europe, will need more gas from its southeast to increase the supply diversity. Secondly, a natural gas hub in Turkey will increase the price competition and source diversity so that European countries will be more eager to supply some of their gas demand through Turkey. Thirdly, geopolitical considerations make Turkey an important alternative, almost unique in its ability to bring together at a single physical hub large volumes of gas from multiple supply sources. If Southeastern Europe is to strengthen its gas infrastructure and gain diversity in terms of source country, it needs more gas from Turkey via either TAP or a bi-directional West Line. In support of this perspective, in the medium term, Turkey's import agreement quantities and capacity could substantially increase and there will be a significant gas volume which could be exported through Turkey.

The action plan of CESEC has three headings identified by the European Commission: priority, conditional priority and other type of projects. Priority projects involve the supply security of Eastern Balkans and completion of Trans-Adriatic Pipeline. The conditional priority projects are substitutes for priority projects, which focused on the Western Balkan Countries. Furthermore, other projects include the full scope of the CESEC that strengthens the natural gas infrastructure of Southeastern European Countries. In order to realize these investments, in addition to investments by the related countries, the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD) will have financing roles on these projects.

⁶² Annual Implementation Report of Energy Community Secretariat - 2018



Map of CESEC Projects⁶³



F. What is Essential to Develop a Regional Gas Hub in Turkey?

1. Comparison of Turkey's Status with Established Hubs in Europe

In order to have a natural gas hub, as a first prerequisite, Turkey needs a transparent and foreseeable gas market. As indicated above, the gas market needs to be foreseeable by non-commercial traders based on information about market fundamentals and not speculation on the actions of monopoly actors, however well-intentioned those actions are in response to Turkey's national priorities. The prerequisite for predictability involves not only price signals but also regulatory actions by authorities.

There are two significant institutions, the Agency for the Cooperation of Energy Regulators (ACER)⁶⁴ and EFET, that continuously monitor European natural gas markets and publish assessment frameworks in order to evaluate market health and best practices.

⁶³ ENTSOG map, compiled by the Energy Community Secretariat

⁶⁴ ACER is a European Union Agency which was created by the Third Energy Package (Directive 2009/73/EC) to further progress the completion of the internal energy market both for electricity and natural gas.



i. ACER Market Health Metrics

To assess the functionality of a wholesale gas market, a Gas Target Model (GTM) was initiated by ACER in 2011 and was updated in 2014. According to ACER-GTM 2, a healthy gas market should have five features, which are summarized in the below table.

ACER GTM 2 Market Health Metrics⁶⁵

Metric	Spot, prompt and forward market together
Herfindahl-Hirschmann Index ⁶⁶	≤ 2000
Number of supply sources	≥ 3
Residual Supply Index ⁶⁷	$\geq 110\%$
Market concentration for bid and offer activities	$\leq 40\%$ market share per company (or group of companies) for the best 120 MW on each bid- and offer-side
Market concentration for trading activities	$\leq 40\%$ market share per company (or group of companies) for the sale and purchase of gas

Evaluating the Turkish Market according to these metrics, the following conclusions can be derived.

i) Herfindahl – Hirschmann Index: 99% of Turkish gas demand has been met by imports so that Turkey’s HHI index can be evaluated through its import activities. As it is previously stated, more than 80% of the gas imports are realized by BOTAŞ through long term pipeline contracts and LNG imports. Doing the math, with a HHI above 6500 according to 2017 figures, Turkey does not meet this criterion.

ii) Number of Supply Sources: Thanks to its advantageous geographical location, Turkey is able to reach a diversified gas producer countries. Supplying gas from 12 countries (Pipeline gas from 3 countries and LNG from 9 countries) in 2017, Turkey satisfies this criterion. Nevertheless, further increasing the sources would be very instrumental in the next years.

iii) Residual Supply Index: In 2017 Turkey imported ca. 29 bcm of gas from Russia which constitutes more than 50% of its annual demand. Therefore, Turkey is highly dependent on Russia in terms of natural gas supply. In case of the absence of Russian gas, Turkey can supply as much as its 85% of demand by assuming full utilization of LNG regasification utilities. In addition, Turkey has taken additional steps to secure its gas supply and has strengthened its residual supply capacity with pipeline investment of TANAP and several LNG regasification facilities like Dörtyol FSRU and Saros FSRU. Despite recent improvements, it will be important to enhance Turkey’s score in this index during the following years.

iv) Market concentration for bid and offer activities: Organized natural gas market in Turkey has become operational quite recently as of September 2018. As a result, it is not yet possible to make a consistent assessment of market concentration for bid and offer activities.

⁶⁴ ACER is a European Union Agency which was created by the Third Energy Package (Directive 2009/73/EC) to further progress the completion of the internal energy market both for electricity and natural gas.

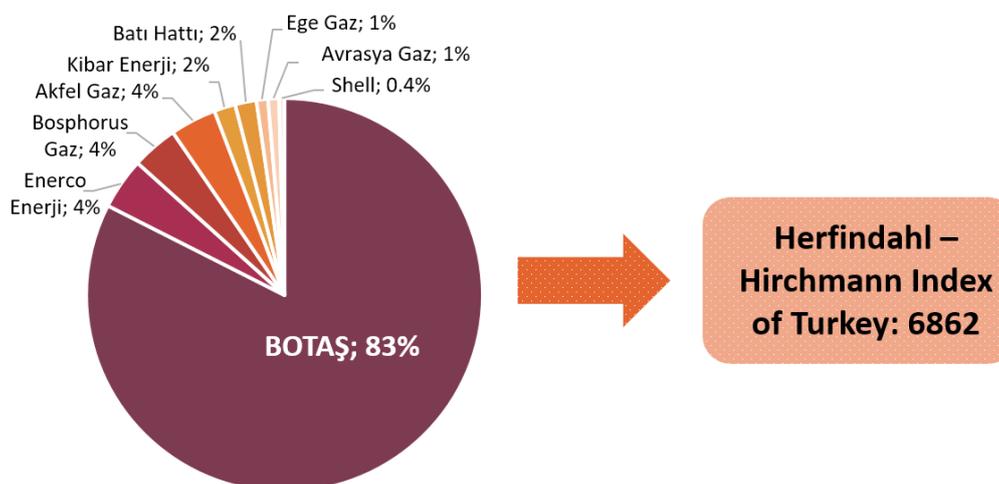
⁶⁵ ACER - European Gas Target Model Review and Update

⁶⁶ Herfindahl- Hirschman Index (HHI) is a measure of the level of concentration in a market and is often used by competition authorities. It is calculated based on sum of the squares of the market shares.

⁶⁷ Residual Supply Index (RSI) is the share of consumption which can be met without largest supplier based on supply capability



Herfindahl – Hirschmann Index of Turkey, 2017⁶⁸



v) Market concentration for trading activities: Related to the previous criterion, there is inadequate information for trading activities. By considering the first three months of the organized market, trade volume of the market is less than 5% of the Turkish gas demand, a highly limited volume for trading activities. For the 4th and 5th criteria, the presence of the state-owned company dominance makes it difficult to achieve any positive indicator.

By considering the above listed 5 criteria determined by ACER, the almost monopolistic power of state owned BOTAŞ effectively compromises the Turkish market structure in the context of developing into a competitive natural gas trading hub. However, during the last months, policy makers took actions to strengthen the gas market structure such as improving RSI through new import channels⁶⁹ and organized market volume and working on decreasing HHI value through BOTAŞ' trade strategy. Nonetheless, a certain amount of time is likely required for the Turkish energy market to evolve from its current dependency on BOTAŞ as a counterparty to new pipeline investments, expansion of natural gas infrastructure and a measure of price stability in Turkey to support economic activity in all sectors and to protect some types of consumers. At the same time, Turkey would benefit from lessening these economic dependencies on the state towards a market system. Establishing the preconditions for a natural gas hub would be only one of the advantages that such an evolution would provide. As a practical matter, BOTAŞ' current long term contracts will not be terminated until midst of 2020's. A certain amount of time must elapse before BOTAŞ would be able to unbundle its contracts and other policies be established to protect Turkish consumers. However, if this approach were taken, Turkey would have a credible opportunity to establish a natural gas trading hub and exceed the requirements such a hub must meet as discussed below.

ii. EFET Gas Hubs Study

The European Federation of Energy Traders (EFET) is another institution that evaluate the competition, transparency and open access of the energy markets. In order to assess natural gas hubs in Europe, EFET has introduced the "EFET Gas Hub Development Study". The institution publishes their study on an annual basis and compares the natural gas hubs in European Region. In this study, each market/hub in the region are evaluated across 18 criteria and a score is calculated. In the EFET's 2018 study, Turkey could only get 6 points out of 20; however, the study was finalized in July 2018, which was before the establishment of the organized natural gas market. Turkey's score would likely show an increase in parallel with the initiation its organized gas market.

⁶⁸ Source: EMRA

⁶⁹ Draft regulation for spot pipeline gas imports was published in early 2019 and comments from stakeholders were collected. According to the regulation, these import activities will be integrated with CTP, will involve monthly, quarterly and annual capacity auctions with a marginal pricing mechanism. The new regulation is expected to be finalized by Summer 2019.



Turkey has met several criteria by establishing an exchange; however, there should be more development on regulatory and transmission operator sides. Moreover, facilitating the increase in liquidity for both spot and forward contracts will boost Turkey’s score further.

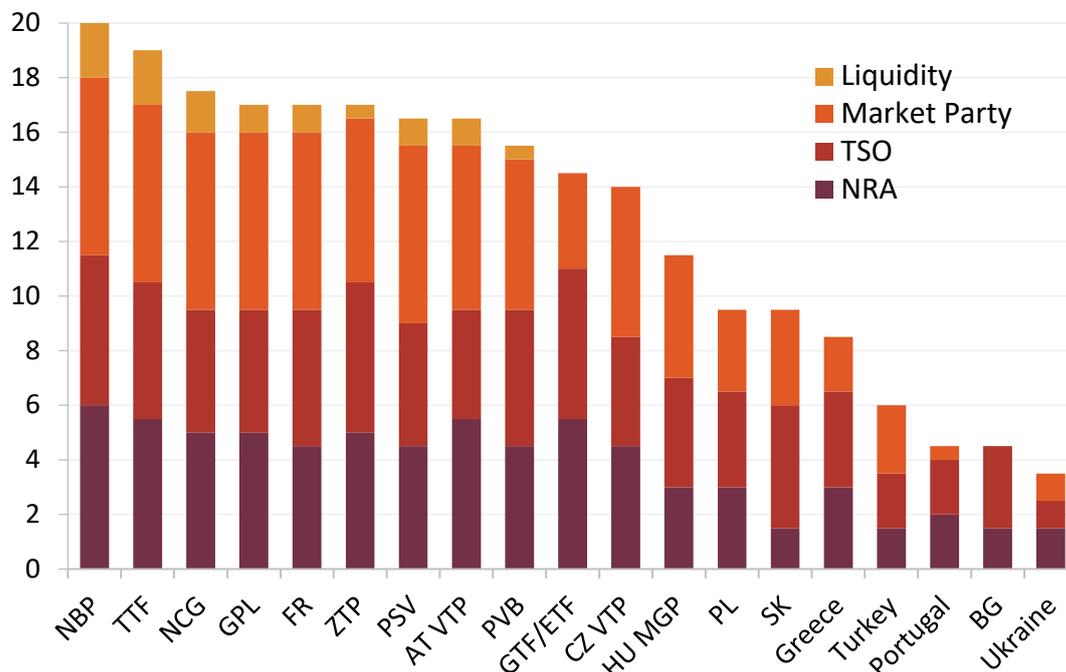
EFET remarks that the hubs scoring above 17 or more are considered as mature, so that several significant steps must be taken by Turkish policy makers in order to establish an internationally accepted natural gas hub.,

EFET Gas Hubs Study – 18 Criteria for Best Practice Development Model

#	Criteria	Value	Turkey's Score	#	Criteria	Value	Turkey's Score
1.a	Transparency and consultation	1.5	0.5	1.b	Transparency and consultation	1.5	0.5
2	Entry-exit system established	1	1	3	Title Transfer	1	0
4	Cash-out rules (long short positions imbalances set to zero at the end of the day with payment/receipt of imbalance charge in local currency/MWh)	1	0.5	7	Resolve market structural and concentration issues (defined role for historical player if flexibility/liquidity is scarce)	1	0
6	Licensing and reporting obligations	1	0.5	5	TSO system balancing	1	0
8	Hub fees (not fees relating to participating on a exchange or trading platform)	1	0.5	9	Establish a reference price at the hub for contract settlement in the event of default	1	0
10	Standardised contract	1	1	11	Price Reporting Agencies producing daily prices at the hub	1	1
12	Voluntary market makers operating at the hub	1	0	13	Brokers	1.5	0.5
14	Establishment of exchange	1.5	0	15	Hub price becomes reliable and used as benchmark	1	0
16.a	Hub spot (shorter than monthly products) liquidity	1	0	16.b	Hub forward (monthly products or longer) liquidity	1	0
Total		10	4	Total		10	2

In the EFET’s 2018 study, 20 countries/hubs were evaluated and only 6 of them were considered as mature. Turkey ranks 16th among evaluated markets but possesses significant motivation to work on improving this ranking as discussed throughout this Study.

EFET Gas Hubs Study – Total Hub Scores, 2018

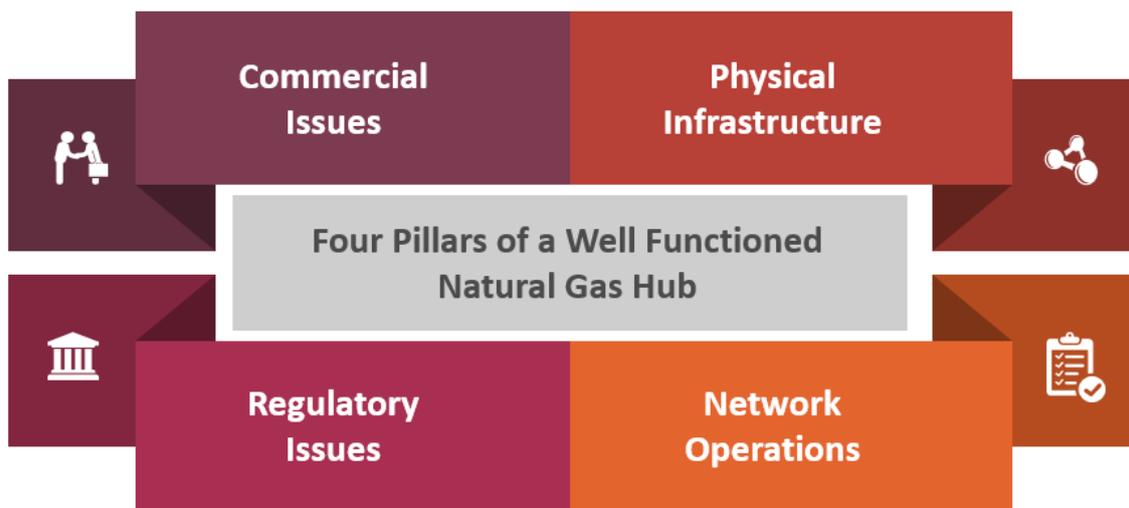




Turkey still lacks the most prominent features of well-functioning natural gas hubs and therefore concrete steps are needed to evolve into one. Without these steps, Turkey can only function as a gas corridor which transports gas to Europe from various producers and end up with a limited revenue share of the gas trade. With the strong rationale to become a natural gas hub, evaluations of international assessors such as ACER and EFET represent a key benchmark to realize this ambition.

2. Four Pillars of a Well-Functioning Natural Gas Hub

In consideration with the ACER and EFET's evaluations and current international natural gas hubs, there are four main pillars that Turkey must establish to become an international gas hub:



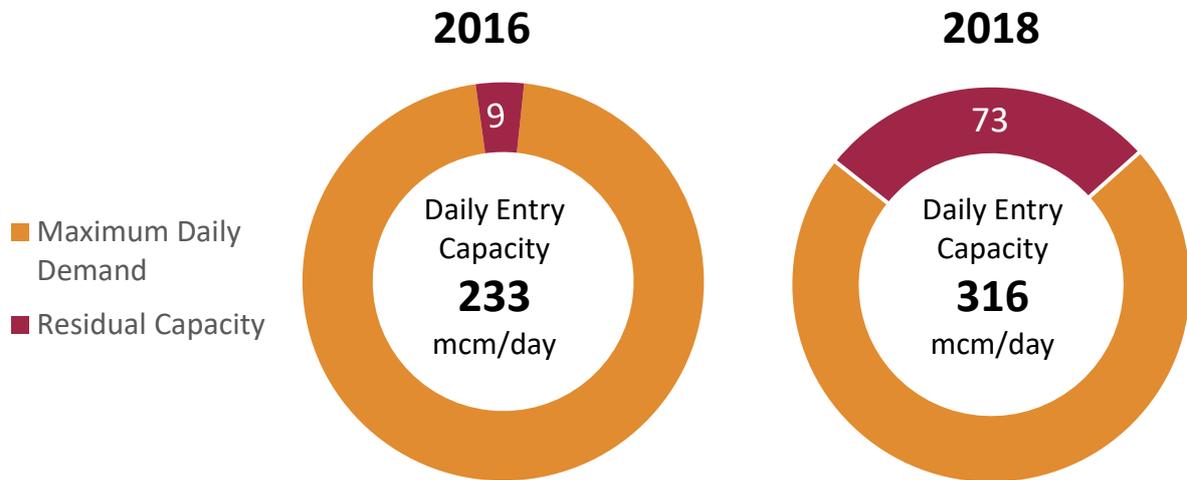
i. Physical Infrastructure

The costliest items to become a physical natural gas hub can be considered as the development of infrastructure. Turkey has already solved these problems for domestic market. In line with distribution investments and increasing network and subscription penetration rates, all of the 81 cities will be able to reach natural gas via pipelines as of end of 2019. Domestic consumption of natural gas drives a huge seasonality effect and leads the gas demand increase. Gas curtailments during harsh winters were a norm until 2017, despite the annual contractual quantities exceeding demand. Gas demand causes spikes in cold periods due to heating demand, and before 2017, gas supply capacity of Turkey was barely meeting peak heating demand, resulting in supply shortage for natural gas fired power plants during these periods. During the last year, Turkey has finalized significant investments on the gas infrastructure and the daily maximum withdrawal capacity has almost doubled during the last decade.

As it is illustrated in the figure below, the historic daily maximum gas demand was 233 mcm/day until 2016 which was also limited by the daily gas entry capacity. After 2016, in parallel with increasing entry capacities annual maximum daily demand figures reached up to 243 mcm and 229 mcm in 2017 and 2018, respectively. Hence, at least 28% residual capacity has been allocated through 2018 and any gas shortage because of the entry capacity is not expected for the upcoming years.

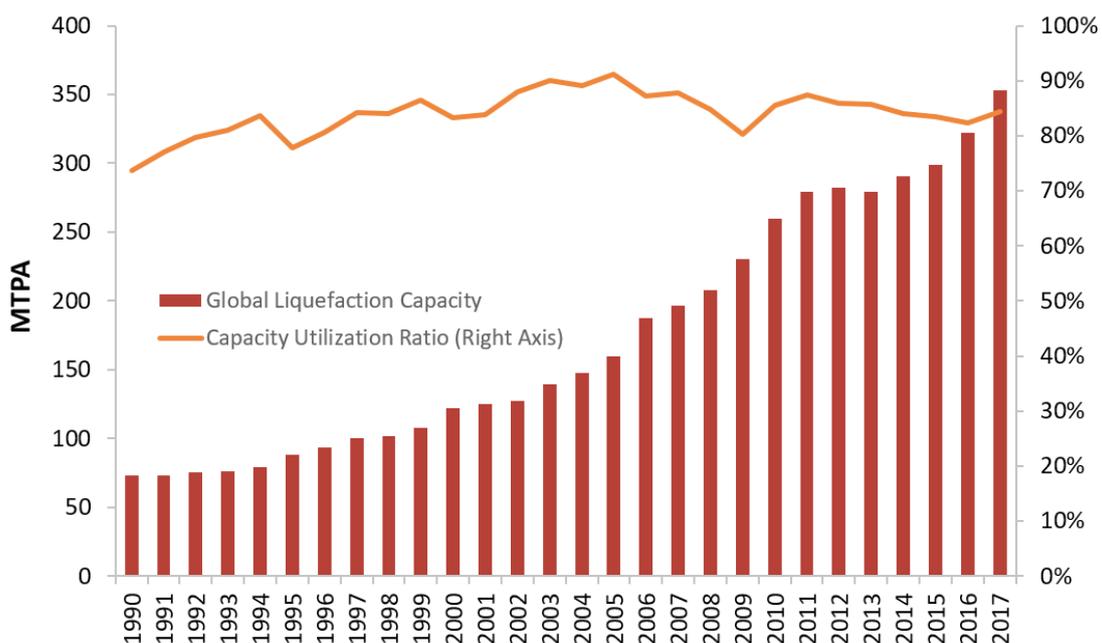


Gas Entry Capacity and Peak Demand Analysis of Turkey, 2016 and 2018⁷⁰



Until 2010's main aim of the Turkish Authorities was to meet the increasing gas demand so that Turkey has mainly focused on the distribution networks and import capacities. Thanks to strategic investments on the national gas infrastructure, Turkey has strengthened its domestic gas market in physical basis. However, in order to be a gas hub, Turkey must also have a significant export capacity via either pipeline or LNG. In this sense, LNG regasification capacity is also a critical factor for supply diversification. IEA's WEO 2018 report iterates this fact by stating that the LNG share in global gas trade is increasing.

Global Natural Gas Liquefaction Capacity, 1990-2017⁷¹



⁷⁰ MENR, BOTAŞ, EPIAŞ

⁷¹ IGU 2018 World LNG Report



In order to export gas to Europe, it is known that there are ongoing projects between Turkey and its neighbor countries in its western border, Greece and Bulgaria⁷². Moreover, Turkish Authorities acknowledge the importance of the facilitation of cross-border flows without curtailment risks. Therefore, Turkey is close to meet the physical infrastructure constraints to be a natural gas hub in parallel with its increasing export capacities and the projects like TAP and CESEC. Reverse flow options via West Line could also be instrumental in this respect.

ii. Network Operations

Network operations are a critical component of a natural gas hub. Market design should ensure the market players on transparency of the physical markets and enable them in defining their positions in the commercial markets. Transparent, fair and practical market operations structures help create predictable market prices. In Turkey, BOTAŞ is responsible from the network operations as the incumbent transmission company. In this sense unbundling of BOTAŞ's network operations from its trade operations is crucial for Turkey to be a natural gas hub. Currently, BOTAŞ has compartmentalized its trade and transmission operations internally and these functions are operated separately. However, the market needs further unbundling to create the necessary habitat in which a natural gas hub can thrive. Efforts for natural gas market liberalization all over the world have the critical component of creating competition in all links in the value chain; production, import, storage and supply. However, competition in transmission and distribution, is difficult as they are natural monopolies due to the scale of infrastructure investments. A bundled structure creates an uneven playing field due to advantages over competitors by cross-subsidizing the potentially competitive business activities with profits from the monopoly activities. According to the EU legislation, the First Gas Directive (Directive 98/30/EC) required the unbundling of accounts and the Second Gas Directive (Directive 2003/55/EC) legal and managerial unbundling of TSOs was introduced. The Third Gas Directive (Directive 2009/73/EC) brought the more stringent and tight transmission and distribution unbundling requirement. Full legal unbundling of BOTAŞ is still a major prerequisite for the establishment of the gas hub. A prudent policy would balance all of government's social obligations and would likely require a process that would be evolutionary rather than sudden.

On the transparency front, with the establishment of CTP, more information about network operations has become available to the market players under EPIAŞ's platform. Since this platform has only been operational for a short period, market players need to have time to reach the maturity in the network operation for both of the regulatory and commercial parties.

In summary, as the end of 2018, the following aspects of a natural gas hub, are fulfilled in Turkey, but the market needs more transparency, experience and ENTSO-G integration to reach maturity;

- Appropriate capacity booking models
- Effective balancing mechanism
- Transparent tariffs in all sectors from (import to retail)
- Well integrated storage and LNG terminal operations
- Efficient nomination processes
- Commercialized imbalance charging structures

iii. Commercial Issues and Market

A realistic, cost based and transparent price formation structure is a prerequisite for a well-functioning natural gas hub. In order to have a reference gas price, CTP was established under EPIAŞ on September 2018. However, even though mechanisms exist to determine prices in this transparent market, only BOTAŞ possesses enough gas, has contractual flexibility, and serves a portfolio large enough to be a meaningful player in this new market. Therefore, BOTAŞ has a significant influence on the prices in this market.

⁷² <http://www.enerji.gov.tr/tr-TR/Bakanlik-Haberleri/Lozenets-Nedyalsko-Boru-Hatti-Acilisi> <http://www.enerji.gov.tr/tr-TR/Bakanlik-Haberleri/Bakan-Albayrak-TAP-Insaatinin-Temel-Atma-Torenine-Katildi>

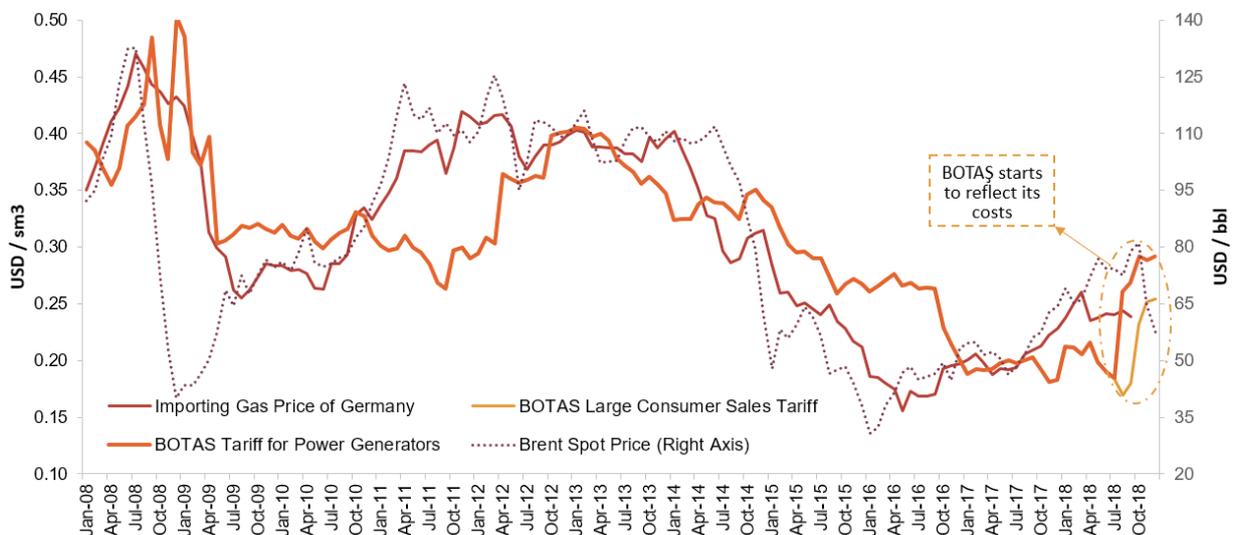


Even though BOTAŞ's gas import prices are not known publicly, German importer company, BAFA, announces its import prices from Russia, which happens to be the largest supplier for the Turkish market. BOTAŞ contracts and German contracts were signed at around the same time periods and known carry very similar clauses in terms of oil indexation and price adjustments. Despite the fact that over the course of time, both contracts had differing price revisions, BAFA announced prices can still be analyzed as a benchmark as to the direction of movement for indexation based price changes. When the BOTAŞ's historic sales prices are analyzed together with BAFA prices and oil prices, it can be deduced that BOTAŞ shifted away from its cost based and cost reflective pricing policy during 2010, reducing predictability for the market. As a recent development, in the August 2018, following a significant devaluation of Turkish lira that drives BOTAŞ's USD based gas import costs, BOTAŞ changed its pricing policy to a USD denominated model and introduced a significant adjustment hike. But this new pricing model did not last long. The ambiguity brought about by the USD anchoring was difficult to manage together with the power market developments, which caused a roll back to the previous model of monthly TL based sales price announcements.

On its road to establishing a competitive gas hub, apart from this largest problem of cost based and cost reflective pricing, Turkey needs to show progress on the below issues to benefit from the merits of a well-functioning gas hub.

- Renegotiating existing contracts to eliminate destination clauses, resolving take-or-pay obligations, increasing flexibility, and making price revisions mark-to-market
 - Taking steps to increase number of market participants, releasing more gas to other players, improving links with the power market, improving the wholesale market, allowing new import licenses
 - Improving transparency and predictability that would ensure a clear pricing strategy as well as elimination of any direct or indirect subsidies within a realistic time plan and economic countermeasures to be taken
 - Establishing alternative markets like futures markets and financial hedging instruments
 - Unbundling of transmission system operator, importer, and wholesaler functions of BOTAŞ
- Each of these items deserve further elaboration, but the list already gives an idea. Based on the views expressed by market players in various venues like sectoral events or publications, there already seems to be a consensus among current market stakeholders about these steps to be taken for the aspired direction.

Brent Oil vs. German Import Prices vs. BOTAŞ Tariffs, 2008-2018⁷³



⁷³ BOTAŞ, BAFA. German import prices were taken as a benchmark for this analysis in order to compare with similar historical contractual conditions. If one were to add the prices from active European hubs to the chart, the price advantage brought by hub competition would be strongly visible.



iv. Overall Regulatory Framework

Last but not the least legal environment in a country is an inevitable prerequisite for a well functioned natural gas hub.

First of all a policy-maker regulatory authority with an advanced knowledge on energy markets must coordinate the gas market. EMRA was established in 2001 in order to regulate the energy markets and a successful transformation was led by EMRA in the electricity market of Turkey. The regulatory authority has almost two decades of experience and possesses a cultivated human capital which are focused also on the natural gas markets. Therefore, as also evidenced by its activities in this market, it can be asserted that EMRA is a capable authority which will support the Turkey's opportunity to be natural gas hub.

Secondly, implementation of the network codes have to be followed closely by market players and regulatory authorities. The effectiveness of the network codes and their utilization in a gas market must be established in order have a reliable gas market which is crucial for a gas hub. Turkey has a regulation for network operation codes which is highly parallel to the regulation in the United Kingdom. Naturally, main export market for Turkey is the European Continent which is regulated by the ENTSO-G codes and current network codes of Turkey should also be integrated with ENTSO-G. There are ongoing developments with CTP and EPIAŞ's platform to amend the network codes and have a more transparent gas market.

References

- ¹ EMRA, Annual Natural Gas Sector Market Report 2017, Ankara, July 2018
- ² EMRA, Annual Natural Gas Sector Market Report 2017, Ankara, July 2018
- ³ IEA, World Energy Outlook 2017, Paris, November 2017
- ⁴ IEA, Global Gas Security Review 2017, Paris, October 2017
- ⁵ IEA, World Energy Outlook 2017, Paris, November 2017
- ⁶ IGU, 2018 World LNG Report - 27th World Gas Conference Edition, 2017, Barcelona, June 2018
- ⁷ IEA, World Energy Outlook 2017, Paris, November 2017
- ⁸ IEA, World Energy Outlook 2017, Paris, November 2017
- ⁹ EMRA, Annual Natural Gas Sector Market Report 2017, Ankara, July 2018
- ¹⁰ Enerdata, Global Energy Statistical Yearbook 2018, retrieved from <https://yearbook.enerdata.net/natural-gas/gas-consumption-data.html>
- ¹¹ EXIST, Transparency Platform, retrieved from <https://seffaflik.epias.com.tr/transparency/dogalgaz/kapasite/max-giris-miktari.xhtml>
- ¹² MENR, Weekly Energy Statistics Bulletin, retrieved from <https://www.enerji.gov.tr/tr-TR/EIGM-Raporlari>
- ¹³ EXIST, Transparency Platform, retrieved from <https://seffaflik.epias.com.tr/transparency/dogalgaz/kapasite/max-giris-miktari.xhtml>
BOTAŞ, 2015-2019 Strategic Plan and BOTAŞ's projections, retrieved from www.botas.gov.tr
- ¹⁴ EXIST, Transparency Platform, retrieved from <https://seffaflik.epias.com.tr/transparency/dogalgaz/kapasite/max-giris-miktari.xhtml>
BOTAŞ, International Natural Gas Contracts, retrieved from www.botas.gov.tr
- ¹⁵ TEİAŞ, Electricity Generation and Transmission Statistics of Turkey, retrieved from <https://www.teias.gov.tr/tr/turkiye-elektrik-uretim-iletim-2017-yili-istatistikleri>
- ¹⁶ EMRA, Annual Natural Gas Sector Market Report 2017, Ankara, July 2018
- ¹⁷ EMRA, Monthly Natural Gas Sector Market Reports January 2014 to October 2018, Ankara, reached in April 2019
- ¹⁸ EMRA, Annual and Monthly Natural Gas Sector Market Reports January 2014 to December 2018, Ankara, reached in April 2019
Turkstat, GDP Statistics, retrieved from <http://www.tuik.gov.tr/UstMenu.do?metod=temelist>
- ¹⁹ EMRA, Monthly Natural Gas Sector Market Reports January 2014 to December 2018, Ankara, reached in April 2019
- ²⁰ EMRA, Monthly Natural Gas Sector Market Reports January 2014 to December 2018, Ankara, reached in April 2019
- ²¹ Bulgartransgaz, Historic Gas Transmission Data, retrieved from <https://www.bulgartransgaz.bg/en/pages/actual-data-transmission-115.html>
- ²² Energy IQ, CEEN Enerji Bilgi Servisleri,(emre.erturk@ceenerji.com.tr) (Available for Subscribers Only)
- ²³ Bulgartransgaz, Historic Gas Transmission Data, retrieved from <https://www.bulgartransgaz.bg/en/pages/actual-data-transmission-115.html>
- ²⁴ MENR, Weekly Energy Statistics Bulletin, retrieved from <https://www.enerji.gov.tr/tr-TR/EIGM-Raporlari>
EXIST, Transparency Platform, retrieved from

<https://seffaflik.epias.com.tr/transparency/dogalgaz/stp/stp-kontrat-eslesme-miktar.xhtml>

- ²⁵ Rzayeva, Gulmira, Gas Supply Changes in Turkey, Oxford Institute for Energy Studies, January 2018
- ²⁶ ICIS, Aura Sabadus, April 9th, 2019, "A comparison of the ICIS indicative LNG DES assessment for Turkey; Russian import prices in Q1/Q2'19 and the Turkish regulated tariff to gas-fired power plants", [twitter post], retrieved from <https://twitter.com/ASabadus/status/1115660633029140480>
- ²⁷ BOTAŞ, BOTAŞ Natural Gas Tariffs, retrieved from <https://ebt.botas.gov.tr/>
- ²⁸ ICIS, Aura Sabadus, March 15th, 2019, "The effect of subsidies on the #Turkish gas market. While all European hub prices are trending lower, Turkey's gas prices remain high because of the oil indexation and a price cap which has not been adjusted to new realities", [twitter post], retrieved from <https://twitter.com/ASabadus/status/1106554816451526656>
- ²⁹ Turkish Competition Authority, Doğal Gaz Sektör Araştırması, July 2012, p.56
- ³⁰ Shi, X., & Variam, H. M. (2018). Key elements for functioning gas hubs: A case study of East Asia. *Natural Gas Industry B*, 5(2), 167-176.
- ³¹ IEA, Developing a Natural Gas Trading Hub in Asia, Paris, February 2013
- ³² EMRA, Annual Natural Gas Sector Market Report 2017, Ankara, July 2018
- ³³ TEİAŞ, Load Dispatch Center Reports, retrieved from https://ytbsbilgi.teias.gov.tr/ytbsbilgi/frm_istatistikler.jsf
EXIST, Transparency Platform, retrieved from <https://seffaflik.epias.com.tr/transparency/tuketim/gerceklesen-tuketim/gercek-zamanli-tuketim.xhtml>
- ³⁴ MENR, Energy Balance Table of 2017, Ankara, November 2018
- ³⁵ Turkstat, Foreign Trade Statistics of Turkey, retrieved from <http://www.tuik.gov.tr/UstMenu.do?metod=temelist>
- ³⁶ EMRA, Annual Natural Gas Sector Market Report 2017, Ankara, July 2018
BOTAŞ, International Natural Gas Contracts, retrieved from www.botas.gov.tr
- ³⁷ Turkstat, GDP and Foreign Trade Statistics of Turkey, retrieved from <http://www.tuik.gov.tr/UstMenu.do?metod=temelist>
- ³⁸ BP, Statistical Review of World Energy 2018, London, June 2018
- ³⁹ Edenhofer, O., Madruga, R. P., Sokona, Y., Seyboth, K., Matschoss, P., Kadner, S., Zwickel T., Eickemeier, P., Hansen, G., Schlöner, S., von Stechow, K. (2018). Special Report on Renewable Energy Sources and Climate Change Mitigation by IPCC. https://www.ipcc.ch/site/assets/uploads/2018/03/SRREN_FD_SPM_final-1.pdf
- ⁴⁰ IEA, Energy Technology Perspectives 2017. <https://webstore.iea.org/energy-technology-perspectives-2017>
- ⁴¹ Howe, M., Ankara Takes Emergency Steps As Pollution Reaches 'Danger Level', *New York Times*, published on Jan. 12, 1982
- ⁴² MNM Consulting Analysis
- ⁴³ Gazprom, Pipeline Projects, retrieved from <http://www.gazprom.com/projects/turk-stream/>
- ⁴⁴ IEA, Natural Gas Information 2018, Paris, August 2018
- ⁴⁵ BOTAŞ, International Natural Gas Contracts, retrieved from www.botas.gov.tr
EMRA, Annual Natural Gas Sector Market Report 2017, Ankara, July 2018
- ⁴⁶ European Commission, Statistical Pocketbook of Energy 2018, Luxembourg, August 2018
- ⁴⁷ U.S. Energy Information Administration, Europe Brent Spot Price FOB, retrieved from <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=rbrte&f=m>
U.S. Energy Information Administration, Henry Hub Natural Gas Spot Price, retrieved from <https://www.eia.gov/dnav/ng/hist/rngwhhdm.htm>

- ⁴⁸ EXIST, Transparency Platform, retrieved from <https://seffaflik.epias.com.tr/transparency/dogalgaz/kapasite/max-giris-miktari.xhtml>
MENR, Weekly Energy Statistics Bulletin, retrieved from <https://www.enerji.gov.tr/tr-TR/EIGM-Raporlari>
- ⁴⁹ EXIST, Transparency Platform, retrieved from <https://seffaflik.epias.com.tr/transparency/dogalgaz/kapasite/max-giris-miktari.xhtml>
BOTAŞ, 2015-2019 Strategic Plan and BOTAŞ's projections, retrieved from www.botas.gov.tr
- ⁵⁰ EXIST, Transparency Platform, retrieved from <https://seffaflik.epias.com.tr/transparency/dogalgaz/kapasite/max-giris-miktari.xhtml>
BOTAŞ, 2015-2019 Strategic Plan and BOTAŞ's projections, retrieved from www.botas.gov.tr
- ⁵¹ European Commission , Central and South Eastern Europe Energy Connectivity (CESEC), retrieved from <https://ec.europa.eu/energy/en/topics/infrastructure/high-level-groups/central-and-south-eastern-europe-energy-connectivity>
- ⁵² IEA, World Energy Outlook 2017, Paris, November 2017
- ⁵³ IEA, World Energy Outlook 2017, Paris, November 2017
- ⁵⁴ IEA, Natural Gas Information 2018, Paris, August 2018
- ⁵⁵ IEA, World Energy Outlook 2017, Paris, November 2017
- ⁵⁶ European Commission , Quo vadis EU gas market regulatory framework – Study on a Gas Market Design for Europe, Brussels, February 2018
- ⁵⁷ European Commission , Quo vadis EU gas market regulatory framework – Study on a Gas Market Design for Europe, Brussels, February 2018
- ⁵⁸ European Commission , Quo vadis EU gas market regulatory framework – Study on a Gas Market Design for Europe, Brussels, February 2018
- ⁵⁹ ENTSOG, The European Natural Gas Network (Capacities at cross-border points on the primary market), July 1st 2017, retrieved from https://www.entsog.eu/sites/default/files/2018-09/ENTSOG_CAP_2017_A0_1189x841_FULL_064.pdf
- ⁶⁰ IEA, Natural Gas Information 2018, Paris, August 2018
- ⁶¹ European Commission , Annual Implementation Report of Energy Community Secretariat - 2018, Vienna, September 2018
- ⁶² European Commission , Annual Implementation Report of Energy Community Secretariat - 2018, Vienna, September 2018
- ⁶³ ENTSOG, The European Natural Gas Network (Capacities at cross-border points on the primary market), July 1st 2017, retrieved from https://www.entsog.eu/sites/default/files/2018-09/ENTSOG_CAP_2017_A0_1189x841_FULL_064.pdf
- ⁶⁴ The Agency for the Cooperation of Energy Regulators, ACER, retrieved from https://www.acer.europa.eu/en/The_agency/Pages/default.aspx
- ⁶⁵ The Agency for the Cooperation of Energy Regulators, ACER, European Gas Target Model review and update, Ljubljana, January 2015
- ⁶⁶ Herfindahl- Hirschman Index (HHI) is a measure of the level of concentration in a market and is often used by competition authorities. It is calculated based on sum of the squares of the market shares.
- ⁶⁷ Residual Supply Index (RSI) is the share of consumption which can be met without largest supplier based on supply capability
- ⁶⁸ EMRA, Annual Natural Gas Sector Market Report 2017, Ankara, July 2018
- ⁶⁹ Energy IQ, CEEN Enerji Bilgi Servisleri (emre.erturk@ceenerji.com.tr) (Available for Subscribers Only)
- ⁷⁰ EXIST, Transparency Platform, retrieved from <https://seffaflik.epias.com.tr/transparency/dogalgaz/kapasite/max-giris-miktari.xhtml>
MENR, Weekly Energy Statistics Bulletin, retrieved from <https://www.enerji.gov.tr/tr-TR/EIGM-Raporlari>
BOTAŞ, Electronic Bulletin Table, retrieved from <https://ebt.botas.gov.tr/>
- ⁷¹ IGU, 2018 World LNG Report - 27th World Gas Conference Edition, 2017, Barcelona, June 2018
- ⁷² MENR, Press Release, retrieved from <https://www.enerji.gov.tr/tr-TR/Bakanlik-Haberleri/>
- ⁷³ BOTAŞ, BOTAŞ Natural Gas Tariffs, retrieved from <https://ebt.botas.gov.tr/>
Federal Office for Economic Affairs and Export Control, BAFA, German Natural Gas Import Prices, reached in March 2019