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**Developing Natural Gas Trading Hub in Turkey**

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## **Abstract**

Turkey itself is a big and rapidly-growing energy market. Turkey's energy demand growth has been among the fastest in the world. The natural gas consumption of Turkey has reached to 46.5 bcm in 2012 and is expected to reach 47.6 bcm by 2014. World natural gas markets are changing. In recent years due to the higher gas prices natural gas markets are evolved in order to maintain the competitive and liberal markets. Subsequently natural gas trading hubs have been emerging. Natural gas price is based on gas-to-gas competition, market forces in these trading hubs. Turkey has been pursuing policies towards being a natural gas trading hub in the region. This project is aiming to analyse the US and the EU and the UK models in order to provide suggestions for Turkey to become natural gas trade hub.

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## **Symbols and Abbreviations**

bcm	billion cubic meters
BG	British Gas PLC
BGC	British Gas Corporation
BOTAŞ	Petroleum Pipeline Corporation
BP	British Petroleum
EMRA	Republic of Turkey Energy Market Regulatory Authority
EU	European Union
GDP	Gross Domestic Product
IMF	International Monetary Fund
LNG	Liquefied Natural Gas
mtoe	Million Tonnes of Oil Equivalent
TANAP	Trans Anatolian Natural Gas Pipeline
UK	United Kingdom
US	United States

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## **1. Introduction**

Natural gas is the major fuel for electricity, heating and industry sectors and there is an opportunity for the usage of natural gas, substitution for oil, in transportation sector. With the shale gas developments, gas has become main hydrocarbon fuel towards a low carbon future. Gas is considered to be a solution to the energy, security and climate issues. Especially for intermitted renewable resources, natural gas is considered to be a backup fuel. Therefore it has been referred as golden age of gas and the role of the natural gas in the energy mix will continue to grow in the future.

Energy constitutes an essential and increasingly significant ingredient for prosperity and economic development of all countries. Energy is the basic input with no substitutes for the sustainable development. Sustainable, secure, adequate, affordable and clean supply of energy is a necessary precondition for development. Energy is now considered long term and global issue. Since the drivers of energy sector differ among regions, the priority of energy issues varies region by region indeed country by country in the region.

Nevertheless, the energy world today faces unprecedented uncertainty. The recent economic crisis has led energy markets around the world into turmoil and the pace at which the global economy recovers holds the key to energy prospects for the next several years. The economic crisis has had a significant impact on energy. The slowdown of industry has reduced energy demand in all sectors.

Without doubt the geopolitical events that have unfolded over the course of 2011 and 2012 to date are of great significance to the global energy sector. The events including Arab Spring in the Middle East and North Africa region (now in particular the Syria crisis) and the Fukushima accident which arose from the tragic tsunami of 2011 have been compelling governments to revise their energy agenda.

On the other side of the world, Asia is today the main and rapidly growing client for gas, both LNG and pipeline gas. Japan, South Korea, India and China are to the fore, as they seek energy for their booming economies. The gas market is changing from isolated regional markets linked to fixed pipeline infrastructure to the supra-regional markets interconnected by the rapidly growing share of LNG in overall gas trade.

Since Industry Revolution, the greenhouse gases have been rising due to the human activities. As these gases trap heat and eventually cause global warming, there has been broad international consensus that climate change issue should be considered both national and international basis. The global economy during 20th century was hugely benefited from natural resources of fossil fuels – coal, oil and gas, however the carbon economy of previous years, based on dominant uses of fossil fuels during past 150 years, is now facing environmental and climate change challenges. Climate change is largely caused by burning of fossil fuels.

Natural gas, the cleanest of all the fossil fuel, is projected to play an increasingly important role in the global energy economy. It has a higher share of the global energy mix in 2035 than it does today. It is the only fossil fuel for which demand rises. In order to maintain diverse, low-carbon and secure energy supply, renewable resources have been considered in the energy mix. Governments have been planning to backup the intermittent renewable resources with natural gas. Therefore there are powerful arguments in favour of a bright future for natural gas. Fundamental factors on both the supply and demand side point to an increased share of gas in the global energy mix. High energy prices force energy sector actors into introducing technological changes to commercially exploit energy resources. In recent years, major developments in unconventional gas, frequently called as game changer, have been taking place.

Natural gas except for LNG has to be transported by pipelines thus its transportation is expensive and difficult. Hence its trade is limited to regions such as US and Europe. In the past the market trend was to conclude long

term contracts for natural gas in order to affirm long term commitment thus it was not possible to determine spot market price with long term contracts. Therefore in order to minimise the price risk, the gas price was indexed to oil which was considered more stable. World natural gas markets are changing. In recent years due to the higher gas prices natural gas markets are evolved in order to maintain the competitive and liberal markets. Subsequently natural gas trading hubs have been emerging. Natural gas price is based on gas-to-gas competition, market forces in these trading hubs. UK's Net Balancing Point and US's Henry Hub are examples of very advanced and complex markets where the price of gas is determined using wholesale trading hubs.

Obviously political, economic, technological and environmental factors do not give a clear picture of how complex energy issues will be tackled now and in the future. In the period of uncertainty and different policy trends and changing consumption patterns, governments should attempt to reduce risks related to the international energy business and investment through cooperation. Nonetheless energy supply security issue, which was initiated with the global oil disruption crisis and then now is sophisticatedly assessed, has been regarded as the most important issue on the world energy agenda.

Energy supply and demand is inextricably linked to energy security. Without energy security, there is no national security. This applies to all countries across the globe. Energy security is no longer just a question of secure supplies. These supplies must also be sustainable, affordable and clean and safe. Similarly for supply countries and companies, security of demand is an issue of paramount importance - their assumptions on how much and where to invest in upstream development are based on predictable demand.

In today's world, the issue of energy supply security has become a concept closely associated with foreign policy, national security and global stability. It is a fact that there is a growing interdependence in the energy field and this phenomenon boosts the importance of energy relations among the countries and regions as well. In view of the increasing demand for energy, the supply

disruptions and the recent global financial downturn, all countries are in need of considering their policies for enhancing energy security.

In addition to the global energy security concern; since the greenhouse-gas impacts are explicitly observed, climate change issue has been raised by the governments for three decades. As energy-related carbon dioxide emissions make up two-thirds of total global greenhouse gas emissions, this trend must be reversed in order to address concerns over climate change and long-term energy security [1]. In order to decrease carbon emissions and to meet climate change targets, efficient use of energy has been becoming as a necessity for the governments. Energy efficiency enables countries to decrease their energy demand while retaining the standard of living. It will be governments and the way, how they respond to the challenges of climate change and energy security that will shape the future of energy in the longer term.

The global energy supplies are increasingly dependent on availability and mobility of fossil fuels from energy rich nations in terms of hydrocarbon deposits in discrete geological basins across varied geographical terrain to the dominant energy consumers on a number of economic and political alignments. Nowadays, access to and reliability of energy resources are becoming even more important with the increase in energy trade and growing integration of energy markets.

Today, no country is capable of dealing with the energy problems on its own. Likewise, no country can have fully secured energy supplies or referred to as self-sufficient. In such an atmosphere, while energy consumers seek for security of their energy supplies, energy producers seek for security of energy demand to reduce the risks associated with their large long-term investments. On the other hand, transit countries have their own concerns and they form the essential part of the whole energy transit chain. In this context, the cooperation and solidarity among the producers, consumers and transit countries is inevitable in developing regional and global transportation systems. This is core to the effectiveness of the integrated energy markets.

Over two decades, Turkey has been regarded as a key country in the energy markets due to its crucial geopolitical position. Turkey is the natural bridge between source countries and consumer markets. Since the economy and energy demand of Turkey have been considerably increasing, its energy market is very attractive for the investors. Turkey holds a unique geographic location. Therefore Turkey has been setting its internal and external policies by taking into account this geostrategic role. Turkey is located among Europe whose energy demand is rapidly increasing and the Middle East and the Caspian Basin whose natural resources are among the most abundant in the world. On the north Black Sea Basin is located. The Turkish Straits linking Black Sea and Aegean Sea on the west are the crucial marine transportation route especially for landlocked Black Sea, Caucasus and Caspian countries.

Turkey itself is a big and rapidly-growing energy market. Turkey's energy demand growth has been among the fastest in the world. Compared to her growth demand, however, Turkey's domestic energy sources are relatively limited. Specifically on gas, Turkish policy is set to secure gas supplies to satisfy the domestic demand first and then provide enough pipeline capacity to transport Caspian and Middle Eastern gas across Turkey to consumer markets.

It is not possible to target energy independence for the countries which do not have sufficient energy resources to meet their energy demand. Turkey is aware of the fact that its current and future energy demand can only be met with energy import in addition to its own resources. On the other hand, Turkey also recognises the importance of diversity of supplier, route and resource. Hence, Turkey has been bearing in mind this key strategy for more than 10 years when setting its energy policies and targets. In all possible supply/demand scenarios, investments, massive investments, will be needed. In this respect, Turkey's energy sector has gained a lot of interest from foreign investors in recent years.

## **2. Turkey Energy Outlook**

The Republic of Turkey, total area of 783,562 square kilometres, has a population of more than 75.6 million of which more than half is under 45 years old. This young, dynamic and well-trained population is one of the strengths of Turkey in terms of labour force.

### **2.1 Economy**

Turkey is a country with a huge and growing market. In 2012, Turkish economy expanded by 2.2% and in the first quarter of 2013, Turkish economy grew by 3% [2]. According to the IMF, Turkish economy is expected to grow by 3.4% and 3.7% in 2013 and 2014 respectively [3]. Turkey is ranking 17th among 190 world nations in the World Bank GDP list [4].

### **2.2 Exports and Imports**

In 2012, the value of exports and imports of Turkey were approximately 152.5 and 236.5 billion US dollars respectively [5]. Germany, Iraq, Iran, UK, United Arab Emirates, Russia, Italy, France, The United States and Spain are among the top export countries [6]. Turkey major exports are: textiles and clothing, automotive, iron and steel, white goods and chemicals and pharmaceuticals and Turkey is also one of the leading shipbuilding nations [7]. The largest partners for imports are Russia, Germany, China, The United States, Italy, Iran, France, Spain, India, and South Korea [8]. Turkey imports mainly machinery, chemicals, semi-finished goods, fuels and transport equipment [9]. One of the major trade partners of Turkey is the EU. Turkey and EU are linked by Customs Union Agreement which came into force in 1995 [10].

### **2.3 Energy Consumption**

Turkey's fast growing economy and market have direct effect on its energy sector. According to BP Statistical Review of World Energy, in the last ten years primary energy consumption of Turkey increased by 63% and reached

to 119.2 mtoe in 2012 from 73.1 mtoe in 2002 [11]. In terms of fuel types, in 2012 Turkey consumed 31.5 mtoe oil, 41.7 mtoe natural gas, 31.3 mtoe coal, 13.1 mtoe hydro-electricity and 1.6 mtoe renewables [11]. While Turkey has growing energy demand trend, the domestic resources are relatively limited. Therefore Turkey is dependent on energy imports. However Turkey has diversified its energy portfolio in terms of resources and routes.

## **2.4 Energy Policies**

The ultimate objective of the Turkish Government is to supply adequate energy in affordable and clean way. Government has been giving the highest priority to the energy supply security. In order to secure energy supply, Government has been targeting the diversification of the resources, routes, supply countries and technologies. By the year 2023 which is the 100th anniversary of the foundation of Turkish Republic, Government has targeted to increase the share of domestic hydrocarbon and renewable sources in the energy mix; materialise two nuclear power plant projects and restructure the energy market in order to enhance competition [12].

More than 70% of total energy demand is dependent on energy imports therefore Government gives high priority to utilise the domestic resources. Even though Turkey's natural gas and oil reserves are negligible when consumption values are taken into account; Government has been focusing on oil and natural gas exploration operations both at home and abroad. As of 1st of January 2013 Turkey has 2343 million tonnes of proved coal reserves and in 2012 coal production increased by 34% compared to 2002 and reached to 15.4 mtoe [11]. Therefore Government is targeting to utilise the entire coal potential and generate 30% of electricity from coal by 2023. Whilst this strategy is considered one of the solutions of the energy import dependence issue, it is also one of the drivers of the carbon emissions. While global trend in relation to the coal usage is to gradually abandon in the energy mix in order to decrease the carbon emissions, Turkish Government coal strategy might be unsustainable and problematic issue in the near future.

Even though Turkey does not have sufficient oil and natural gas resources to meet its increasing demand, Government has the target to have all oil and natural gas resources in the energy mix. Therefore Government has been planning to increase exploration and production activities both at home and abroad to reduce the import risk [12].

### **2.4.1 Renewable Energy**

In terms of renewable energy, Government has been fully supporting private sector for electricity generation from renewable energy resources. In this context, Government has set the target of increasing the share of renewable resources in the electricity generation by 30% by 2023 [13]. In order to reach this target, Government has been planning to increase the installed capacity of renewable energy and install new geothermal, wind, hydraulic and solar energy plants.

### **2.4.2 Energy Efficiency**

Government is fully aware of the fact that the increased energy efficiency contributes to both decreasing energy demand without affecting the development targets and enhancing energy security; therefore using energy more efficiently is promoted by the Government. Government is also aiming to improve energy intensity by improving energy efficiency. In this regard, Government has set the target of reducing primary energy density by 20% compared to the amount in 2008 by 2023 [12]. In addition to the support for energy management system integration and energy manager employment in the industry, Government has been launching energy efficiency awareness campaigns in the country.

### **2.4.3 Market Legislation**

In order to increase the competition in the energy market liberalisation process, Government enacted Electricity Market Law, Natural Gas Market Law, Oil Market Law and Liquefied Petroleum Gases Market Law. These laws brought about major changes in terms of restructuring public owned

companies in the energy sector. Government has been establishing policies towards liberalising energy markets in order to create investment environment that is more attractive for private sector, since Government is estimating more than 120 billion dollars for the total investment needed for the energy sector by 2020 [12]. Even though the significant steps towards establishing functional and transparent energy markets are considered promising progress in especially electricity market, progress towards the liberalisation of natural gas market needs to be accelerated. Government has targeted to secure the formation of competition in the natural gas market by 2015 [12].

#### **2.4.4 Nuclear Energy**

Government has been targeting to generate 10% of electricity from nuclear power plants by 2023 [13]. In this context, in May 2010 Turkey and Russia signed cooperation agreement in relation to the construction and operation of Akkuyu Nuclear Power Plant on the southern part of Turkey and the agreement was ratified in August 2010 [14]. In May 2013, the agreement between Turkey and Japanese-French consortium to build the second nuclear power plant at Sinop on the Black Sea was signed [15].

#### **2.4.5 Energy Diplomacy**

In terms of energy diplomacy, Turkey has been strengthening its international cooperation in the area of especially energy. Turkey indeed holds a strategic role between the world's one of the leading consumers, namely continental Europe, and the world's one of the leading producers, namely Middle East and Caspian. Regionally, Turkey is well located adjacent to regions having more than 70% of the world's proven oil and gas reserves [16]. Given this fact, Turkey has been promoting the east-west and north-south energy corridors across the country for more than a decade. This multi dimensional energy policy aims at securing both its own and partners' energy supplies. Therefore energy diplomacy of Turkey has been considered advance globally.

## 2.4.6 International Oil Pipelines and Projects



Fig. 1. International Oil Pipelines and Projects of Turkey [18]

Turkey is today playing a role as a powerful regional player, strategically straddling both East and West. Oil and gas have played, and will continue to play, a game-changing role in this part of the world. In this context, Turkey has played significant role in the realisation of international oil pipeline projects that provide Middle East and Caspian oil to world markets.

In this context, Iraq - Turkey Crude Oil Pipeline with an annual transportation capacity of 70.9 million tons has been in operation since 1976 [17]. This pipeline transports oil produced in Kirkuk and other areas of Iraq to Ceyhan (Yumurtalık) Marine Terminal from where the oil is further shipped via tankers to world markets [17]. This transported oil accounts for about one third of Iraq's total crude exports [18]. Baku - Tbilisi - Ceyhan Main Export Oil Pipeline with the throughput capacity of 1.2 million barrels per day is 1762 km. of which 1076 km. is within the Turkish territory [18]. Since 2006, pipeline has been transporting oil from the offshore fields in the Caspian Sea through Azerbaijan, Georgia and Turkey to the Ceyhan Marine Terminal on the Turkish coast of the Mediterranean from where the oil is further shipped via tankers to European markets [19]. It is the second longest oil pipeline in the

world (the longest being the Druzhba Pipeline from Russia to central Europe) [20].

The Turkish Straits in the most populated area of the Turkish territory are the sole outlet for oil exported from Russia, Caucasus and Caspian Region through terminals located on the Black Sea to the world markets. Turkish Straits are globally recognised as one of the world's crucial energy transit bottleneck. Increasing traffic through the Straits is posing serious risks for human life, environment and world oil markets. An alternative way of crude oil transportation bypassing the Straits is suggested by Turkish Government. Samsun - Ceyhan Crude Oil Pipeline Project aims to decrease the crude oil tanker traffic through the Turkish Straits. The pipeline starts from Samsun at the coast of the Black Sea and reaches to Ceyhan at the coast of the Mediterranean Sea. Even though Turkish Straits are globally recognised as one of the world's crucial energy transit bottleneck and energy companies are fully aware of the seriousness of the traffic congestion through the Straits; there has been no remarkable progress towards the realization of the Samsun - Ceyhan Project thus far [18]. All these pipelines and projects provide a good opportunity for Ceyhan Terminal to become a major energy hub and the largest oil outlet terminal in the Eastern Mediterranean, as Ceyhan Terminal has already been designed to receive crude oil from different countries [18].

### 3. Turkey Natural Gas Market

#### 3.1 Natural Gas Demand and Supply

Turkey itself is a big and rapidly-growing energy market. Turkey's energy demand growth has been among the fastest in the world. The natural gas consumption of Turkey starting in late 1980s with some 500 million cubic meters have reached to 46.5 bcm in 2012 and is expected to reach 47.6 bcm by 2014 simply driven by the need for electricity generation [18]. Compared to her growth demand, however, Turkey's domestic energy sources are relatively limited. Specifically on gas, the policy is set to secure gas supplies to satisfy the domestic demand first and then provide enough pipeline capacity to transport Caspian and Middle Eastern gas across Turkey to consumer markets. Turkey can be said to have diversified sources of gas supplies. Current gas exporters to Turkey include the Russian Federation, Azerbaijan and Iran in the form of pipe gas and Algeria and Nigeria in the form LNG.

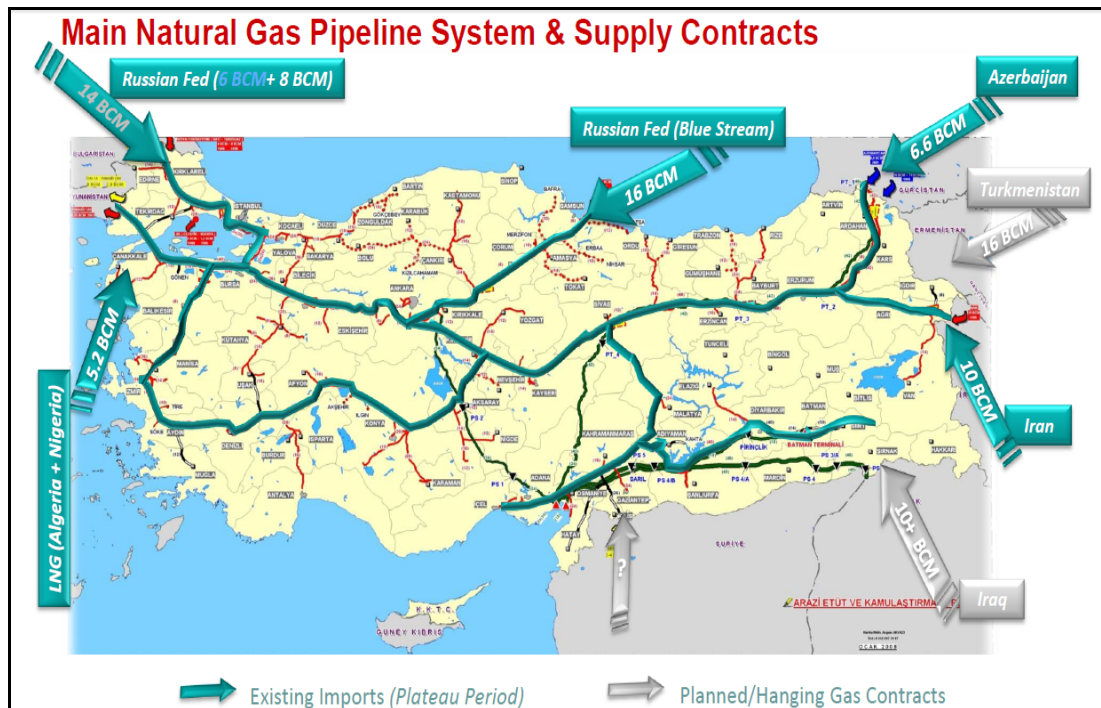


Fig. 2. Main Natural Gas Imports of Turkey [21]

For the countries which are dependent on natural gas imports to meet their demand, it is more appropriate to approach the concept in two perspectives: purchasing gas from international market and selling gas in the domestic market. Having acknowledged this fact, Turkish Government has been approaching energy security concept from a broad perspective as being an importer of gas on one hand and the high prospects for transit, on the other. Therefore Turkey has been supporting gas transit across the country and this policy contributes to enhancing the regional energy security in terms of gas as well.

### **3.2 International Gas Pipelines and Projects**

Turkey has been leading to the formation of an East-West energy corridor which foresees the transportation of energy sources of Caspian Basin, Middle East and Central Asia to Europe and further to world markets. In line with this policy, over the long term some 100 bcm of natural gas is assessed to be transported via Turkey and studies are underway in order to transit some 40 bcm of natural gas through Turkey to Europe in short to medium term.

In order to achieve the goal, being a transit country and commercial hub, Turkey has been making outstanding contributions to well-known projects on the global stage since 2000.

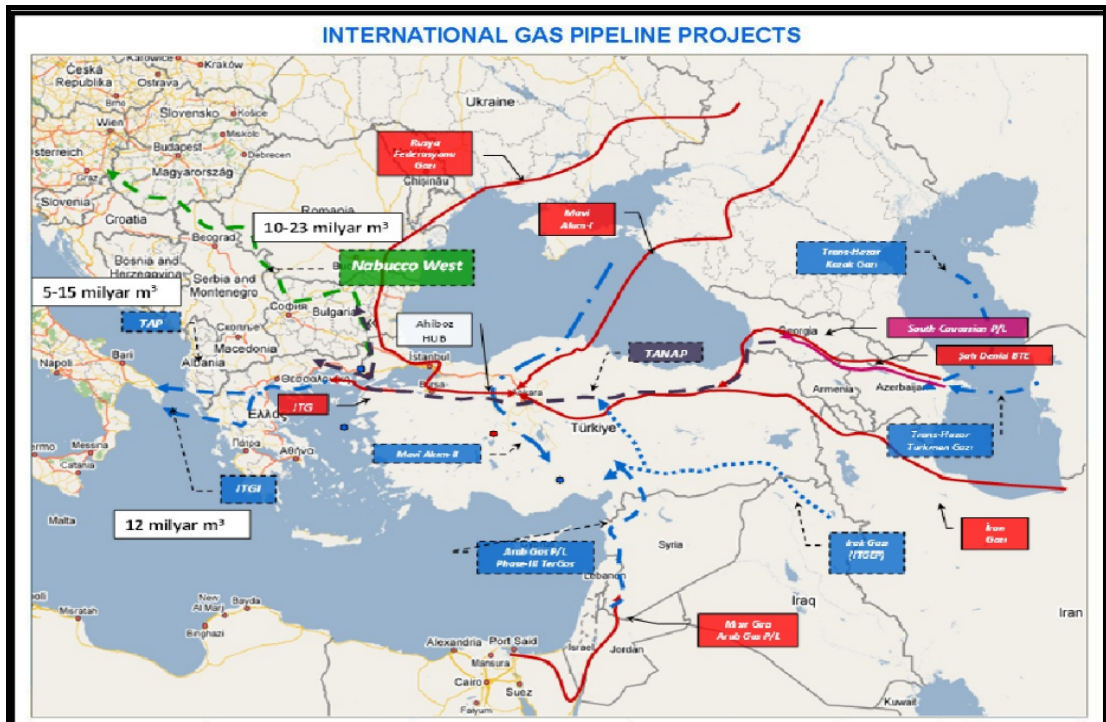


Fig. 3. International Gas Pipelines and Projects of Turkey [22]

Right after the discovery of the Shah Deniz Natural Gas field in the Caspian Sea, Turkey has been the first and sole purchaser of this Phase I gas in the year 2001 with volume of 6.6 bcm per year. In a way, Turkey could be viewed as a promoter of this Project both as an investor and customer. The Baku – Tbilisi - Erzurum or South Caucasus Pipeline which currently transports Shah Deniz gas to Turkey is designed to transport volumes up to 20 bcm per year with the intention of meeting the future demand of Turkey as well as some volumes for transit to European markets. Following the delivery of first gas in late 2006 through the South Caucasus Pipeline and the start of the commercial operations in mid 2007, Turkish Government has initiated the respective gas transit projects with the potential consumers.

The Turkey - Greece Natural Gas Pipeline, in operation since 2007, is one of the strategic expansion projects towards Europe. In 2007, an intergovernmental agreement among the Republic Turkey, the Hellenic Republic and the Republic of Italy was signed among the respective ministries of the three countries in order to further extend the existing Turkey - Greece Natural Gas Pipeline to Italy. As per provisions of this intergovernmental agreement, the Project was structured for the delivery of

11.6 bcm per year to Turkish - Greek border by using the Turkish national grid. The shippers through this pipeline project namely DEPA of Greece and Edison of Italy were entitled to construct the Adriatic Sea passage. 8 out of 11.6 bcm had been planned to be delivered to Italy.

During the next course, different from the Turkey - Greece - Italy Pipeline project structure which foresees the utilization of the Turkish natural gas grid across the Turkish territory, in the year 2009, an agreement among the Republic of Turkey, the Republic of Bulgaria, Romania, the Republic of Hungary and the Republic of Austria regarding the Nabucco Project was signed by the Prime Ministers of the countries. This agreement has entered into force by 1st August 2010. The Agreement outlines the project as starting from Eastern or Southern borders of Turkey and ending up in Baumgarten Austria with an ultimate capacity of 31 bcm/year. The Nabucco Project basically foresees construction of a new and dedicated pipeline with an option to use the existing grid where available along the route. With the signing of the Project Support Agreements between Nabucco Companies and the responsible ministries of the five transit countries on June 8, 2011 in Turkey, the legal framework for the Nabucco Pipeline has therefore been completed.

With the agreements regarding the Turkey - Greece - Italy Pipeline and Nabucco Pipeline Projects, Turkey has already made available and established the respective legal infrastructure for transit of gas across its territory. With Turkey - Greece - Italy Pipeline Project, Turkey has offered utilization of its existing and future upgraded grid and with Nabucco Project Turkey has also welcomed erection of a new pipeline. In terms of transit of gas via Turkish territory with any possible project model, Turkey has been doing its best.

Simultaneously, Turkey and Azerbaijan including the Shah Deniz Consortium have been negotiating on sale of gas to Turkey both under the Shah Deniz Phase I and Phase II Projects as well as transit of gas through Turkey. Contrary to the earlier project models established by either Turkey - Greece -

Italy Pipeline Project or Nabucco Project, a new approach has been introduced by Azerbaijan and the Shah Deniz Consortium. The new approach foresees up to 10 bcm transit of Shah Deniz Phase II gas across the territory of Turkey. This simply calls for delivery of Shah Deniz Phase II gas at the eastern border and re-delivery at the western border of Turkey. In this context, an Intergovernmental Agreement concerning the sale of Shah Deniz Phase II gas to Turkey and the transit passage of natural gas originating from Azerbaijan across the territory of Turkey and the development of a standalone pipeline for the transportation of natural gas across the territory of Turkey was signed between Turkey and Azerbaijan on 25th of October, 2011 in Turkey. On the same date, commercial agreements between BOTAŞ and the Shah Deniz Consortium were also signed in case the national grid of BOTAŞ was upgraded to transit the natural gas.

With these arrangements there were two options for the transit of Azeri gas either via BOTAŞ national transmission system or via standalone pipeline across the territory of Turkey. In order to facilitate the realization of the dedicated pipeline the Memorandum of Understanding concerning the development of a standalone pipeline for the transportation of natural gas originating and transiting from Azerbaijan across the territory of Turkey was signed between Turkey and Azerbaijan on December 24th of 2011 in Turkey. The project will have minimum 16 bcm per year capacity and will be scalable to accommodate future natural gas volumes originating and transiting from Azerbaijan. On 26 June 2012, the Intergovernmental Agreement of the Trans Anatolian Natural Gas Pipeline Project was signed between Turkey and Azerbaijan and the Host Government Agreement of TANAP Project was signed between Turkey and the TANAP Project Entity. These are the essential and sufficient documents which enable the TANAP Project to realise. With the signing of these agreements, the legal framework for the transit via dedicated pipeline, TANAP, in the territory of Turkey has been properly set.

TANAP Project is considered as a transit pipeline within the scope of the Transit Law under the Turkish National Law. Together with Intergovernmental

Agreement and Host Governmental Agreement in which technical and commercial terms and conditions are covered, national law of Turkey will also regulate the TANAP Project. TANAP Project will contribute to the diversification of sources and also European energy supply security. In other words, TANAP Project will facilitate the realization of the other projects within the Southern Gas Corridor. In the long term the additional gas from Turkmenistan via Trans-Caspian Natural Gas Pipeline could also be delivered by TANAP System to Europe. TANAP will transport the gas from the eastern border to the western border of Turkey. The gas delivered at the western exit point of Turkey will follow south route onwards Europe with Trans Adriatic Pipeline Project.



**Fig. 4.** TANAP Project [18]



Fig. 5. TAP Project [23]

Turkey has provided the necessary and favourable legal background for transit of gas through its territory. All these international gas pipelines and projects clearly indicate that Turkey is dedicated to play a key and driving role in transportation of the Caspian, Middle Eastern and Middle Asian energy resources to consumer markets in a timely, reliable, cost-effective, environmentally sound and high-quality basis [18].

### 3.3 Domestic Natural Gas Market

The Turkish gas sector is regulated by the Energy Markets Regulatory Authority. The sector is dominated by state-owned Petroleum Pipeline Corporation, BOTAŞ. BOTAŞ owns the domestic transmission network and has a monopoly over domestic natural gas sector. Domestic natural gas price is set by the BOTAŞ pricing structure as BOTAŞ has the dominance in the natural gas market in Turkey [24]. BOTAŞ has gas purchase agreements with Algeria for 4 bcm per year LNG and Nigeria for 1.2 bcm per year LNG; Iran for 10 bcm per year pipe gas, Russia for 24 bcm per year pipe gas and

Azerbaijan for 12.6 bcm per year pipe gas [25]. BOTAŞ regularly posts prices and its Industrial Interruptible Tariff benchmark price (BOTAŞ Reference Price) [24]. After BOTAŞ's 6 bcm gas purchase contract was expired, it was renewed by private sector. SOCAR' Turkish Unit started to buy 1.2 bcm from BOTAŞ. With these recent changes, 4 bcm share of private sector in the natural gas market reached to 11.2 bcm in 2013.

Ultimate target is to provide the natural gas for customers in a secure and affordable way. Therefore global trend is to develop liberalised natural gas markets. Since the competition between the suppliers is high and the price is linked to the actual cost of natural gas in the liberalised markets, the end-users benefit most from the lowest possible price. Natural gas market liberalisation concept has been ranking high on Turkey's energy agenda for more than 10 years. Turkey has been adopting policies towards free competitive natural gas market aiming to provide reliable and affordable natural gas to customers.

Natural gas market in Turkey opened competition in 2001 with the Natural Gas Market Law. The Law structured in order to maintain liberalised market by introducing competition in order to comply with the EU energy acquis in the natural gas sector. The Law has provisions in relation to the unbundling, market opening, and independent regulatory body and third party access. Since then there has been remarkable progress in the distribution sector however the Law is not entirely fulfilled. One of the objectives of the Law is to decrease the share of BOTAŞ in the market in order to end the monopoly. For this purpose the Law covers the contract releases process however the desired level has not been reached. The unbundling of BOTAŞ in order to separate the business divisions is covered in the Law however now BOTAŞ is not fully restructured.

For all these reasons, Government has been working on the revision of the Law in order to set more achievable targets in the way of liberalisation process. In this context, Government has been welcoming the opinions of the market private and public players. The provisions in relation to especially

pricing system and contract realise and unbundling of BOTAŞ are regarded as the first priority as these are the main obstacles that should be overcome in order to maintain the liberalised natural gas market in Turkey. It is significant that the revised Law should reflect the needs of the current and future natural gas market, thus the opinions of the different public and private players in the sector are seriously considered by the Government. It is also significant to support the Law with the secondary legislations and the Law and these legislations should be enacted at the earliest possible time.

## **4. United States**

### **4.1 Supply and Demand**

In 2012 US supplied its energy demand of 36% from oil, 27% from natural gas, 18% from coal, 8% from nuclear electric power, and 9% from renewable energy [26]. US domestic energy production supplied approximately 83% of this demand [26]. US energy supply is mainly driven by fossil fuels. Due to the advanced extraction techniques, US hydrocarbon production has increased in recent years. The coal production increased from 25% in 1949 to 51% in 1971 to 68% in 2011 [26]. In 2012, natural gas production was higher than in any previous year owing to the more efficient and cost-effective drilling techniques applied in production of natural gas from shale formations [26]. In 2012 crude oil production was the highest since 1995 [26]. Even though US meet its energy demand from mostly domestic production, in 2012 16% of all energy consumed in the US was imported [27]. In fossil fuels, crude oil is the major imported hydro carbon and in 2012 almost 75% of total petroleum consumption was for transportation [27].

Natural gas supply of US comes from mostly domestic production and some imported pipe gas from Canada and small amount of LNG from different source countries such as Egypt, Qatar, Trinidad and Tobago, and Yemen [28]. In addition to conventional resources, US have considerable expertise on unconventional resources production. US have been producing shale gas since 1990s thus the country has been considered as a technology pioneer. According to Annual Energy Outlook of US, all natural gas production is projected to increase from 23.0 trillion cubic feet in 2011 to 33.14 trillion cubic feet in 2040 and shale gas production is projected to increase from 7.85 trillion cubic feet in 2011 to 16.7 trillion cubic feet in 2040 [29]. This shale gas production increase has significant effect on natural gas markets.

## 4.2 Natural Gas Market

As US has been producing natural gas for a very long time, US has an advanced experience and technology in the business. The development stages of the natural gas market of US are similar to those of UK. US started the process by ending the control of companies over the business and establishing the regulator for the sale and shipment of natural gas [30]. In order to develop integrated and fully functioning market, it is significant to establish a regulatory authority. US established authority to construct pipelines and storage facilities. US were entering into long term contracts and there was not a benchmark price for these contracts [30]. With the legislations and regulations US gradually removed price controls on the natural gas [30]. All these legal and structural changes paved the way for the creation of an open and transparent continent wide market in natural gas [30]. This approach was applied to natural gas storage as well. Gas prices started to be set by the forces of supply and demand and this enabled sound spot market to emerge. In order to enhance the market, pipeline network and midstream facilities were to be extended. US has established expanded pipeline network in the continent and pipeline connections are in place across the country. Thus US have fully integrated natural gas market. Infrastructure is very important in the natural gas business, since existing infrastructures should be upgraded and/or new facilities should be constructed according to the needs of the future demand and market. In this regard, US has natural gas market has been in good condition.

In the US, the sector has three main activities: production, transmission and distribution. After production the gas is processed and through compressor stations some of the natural gas is stored. Natural gas demand directly changes due to the temperature. During summer the demand is low, while during winter it is high. Since there is demand difference throughout the year some of the gas is stored in order to provide backup during winter. Natural gas is transported by large pipelines and distributed by smaller pipelines to the end users. Natural gas business covers all segments of the sector. The production, storage, transmission and distribution facilities are significant. In

all these segments the infrastructures and facilities should be sufficient in order to demonstrate resilience to supply and demand fluctuations. In this regard, US provide sufficient infrastructure in its natural gas business.

In the US natural gas market similar to other competitive markets the price is set by the demand and supply interactions [31]. The main difference between natural gas and other commodities is that the time of the reaction time of the production segment when the demand is high. Normally, when the demand is high for a commodity the production immediately increases however for natural gas it is not possible to increase the production immediately. Because it takes time to open new production sites and increase the production, therefore it is sometime not possible to respond the increased demand with the increased production. This is the main difference between natural gas and any other consuming product on the market. Natural gas market depends on supply and demand, thus the fluctuations in the supply and demand makes the price volatile.

Natural gas market in the US covers spot market and futures market. The natural gas is sold and purchased in a day in the spot market. Therefore for the day, the spot market price is taken into account. In the futures market buying and selling of natural gas depend on the contracts. In the US there are different locations for natural gas trade. These are market hubs which are located at the intersection of major pipeline systems. At Henry Hub the traded futures contracts reflect the price of natural gas for physical delivery at this hub [32].

## **5. European Union**

### **5.1 Energy Outlook**

European Union demand has been increasing due to the growing population and rising standards of living. In order to meet this demand EU energy imports have been increasing. Supplying affordable and secure energy is the priority for EU. In this context, EU has been targeting to increase the share of the renewable energy by 20%; to increase the energy efficiency by 20% and to decrease the carbon emissions by 20% by 2020. Since the natural gas is the cleanest fossil fuel, it has the biggest share of all hydrocarbon fuels in the EU energy mix. The domestic production of natural gas is not sufficient to meet the increasing demand. Therefore EU has been searching solutions to major energy challenges of increasing import dependence, depleting of its own energy resources, providing secure energy at the low cost for all citizens. Hence, EU energy policy covers all energy resources from hydrocarbons to nuclear and renewable energy. Diversification is the main target of EU to maintain secure, competitive and sustainable energy.

Gas consumption in Europe has rapidly increased during the last 10 years. Today a consensus is well in place that the enlarged EU will need some additional gas within the next 20 years. Since the domestic production is declining, gas imports have been rapidly increasing. Therefore gas supply security and diversification of gas supply and routes concepts have been seriously considered for a long time. EU has been targeting to access natural gas of different source countries in order to enhance its gas supply security and minimise the risk of gas interruptions. In order to reach this target, EU is fully aware of the fact that infrastructures play vital role. Therefore Southern Gas Corridor is the main infrastructure priority for EU. Southern Gas Corridor covers several pipeline projects that would enhance the gas supply security when they are realised. These pipeline projects are structured to provide gas supply from different source countries such as Azerbaijan, Turkmenistan and Iraq. The main objective is to link the gas market of EU to the natural gas rich regions such as Caspian and Middle East. It is estimated that around 20% of

EU natural gas demand by 2020 could be met when the Southern Corridor projects are realised. In order to realise the Southern Corridor projects, EU is aware of the fact that close cooperation is required with resource and transit countries. The pipeline infrastructures should be upgraded and extended. Therefore market development and further competition will be maintained. EU has been pursuing close cooperation with Azerbaijan and Turkmenistan. Turkey is regarded as key transit state. The recent adoption by the European Council of a mandate to authorise the European Commission to negotiate an agreement for the legal framework with Azerbaijan and Turkmenistan for a Trans - Caspian Gas Pipeline System may be regarded as a milestone in the realisation of the Southern Corridor. The consensus among EU and Azerbaijan and Turkmenistan on support of Southern Gas Corridor has been achieved and the agreement between Azerbaijan and Turkmenistan on construction of Trans - Caspian Gas Pipeline is to be concluded. Turkmenistan is set to supply 10 bcm of gas through the Trans-Caspian Gas Pipeline. In order to deliver Turkmen natural gas to the EU, there is a need for the pipeline construction. It is believed that the ongoing discussions will lead to the construction of a pipeline.

Indeed the delivery of Turkmen gas to Turkey is under consideration by Turkey for a long time. An intergovernmental agreement between Turkey and Turkmenistan for the realization of the Trans - Caspian Natural Gas Pipeline dates back to as early as 1998. According to this Agreement, a total of 30 bcm year of Turkmen gas had been planned to be transported through this pipeline, with 16 bcm allocated for Turkey and the remainder to Europe. Even though huge efforts have been spent so far for the realisation of this Project multilaterally, the Project has been pending since then.

Within the framework of Turkey's negotiation process for full membership to the EU, energy is a critical chapter which is not yet opened for negotiations. Analytical examination of the acquis under energy chapter was held in 2006. In the way of the full membership to the EU, Turkey has made progress with respect to adopting the Community acquis. EU and Turkish energy interests

are compatible since both the EU and Turkey are heavily dependent on Russian gas supply and both want to diversify energy resources and routes.

Turkey and the EU are important energy partners, sharing common strategic challenges and objectives. There is great scope for cooperation on issues which are in the interest of both sides. There have been discussions between Turkey and EU to enhance energy relations. It has been agreed to look at concrete possibilities to deepen EU-Turkey energy relations and to focus efforts on mutual interest areas. In this respect long term perspectives on energy scenarios and energy mix; market integration and development of infrastructures of common interest (gas, electricity, oil); global and regional energy cooperation; promotion of renewable energy, energy efficiency and clean energy technologies and nuclear safety and radiation protection are the key cooperation areas.

This cooperation will contribute to a positive agenda for EU-Turkey relations in general, and it will facilitate the eventual integration of EU and Turkey energy markets. Such integration will not only increase security of energy supply in Europe and Turkey, it will also create important business opportunities.

## **5.2 Natural Gas Market**

In Europe gas market approach has been adopted after US natural gas market developments, since the natural gas business dates back to 1960s in Europe while it was started in 1850s in US. Since the natural gas price was linked to the oil price, liquid natural gas market development was relatively slow. Today Europe is importing almost half of its natural gas by pipeline from Russia and North Africa and some LNG is also delivered. The dependence on pipe gas from especially Russia and relatively inflexible natural gas markets are the main supply security concerns of Europe. Therefore Europe has been giving the highest priority to resource and route diversification.

There has been approach towards liberalised natural gas markets in the EU. The UK was pioneer in the developments of liberalised natural gas market. In 1998, EU started to formulate common rules for its internal natural gas market. As a result of these actions spot market in the continent was established. When the regulatory reform is adapted, the desired maturity level of internal natural gas market can be achieved.

## **6. United Kingdom**

### **6.1 Energy Outlook**

UK Government is aware of the fact that the on-going global energy trend is not sustainable in terms of environmental impacts. Therefore the Government has been pursuing its energy policy taking into account of environmental concerns. In this regard, UK has been making every endeavour to supply reliable, affordable and clean energy. Due to the shift from net energy export country to net energy import country, UK has been attaching great importance to the supply security.

#### **6.1.1 Climate Change**

With the emerging climate change issue, the strategies have been directed at reducing the emissions in the UK. The Government has the priority to reduce carbon emissions by at least 80% (from the 1990 baseline) by 2050 while strengthening its energy efficiency and supplying 15% of energy demand from renewable sources by 2020 [33-34]. Hence UK's energy policy is primarily shaped by the nexus of climate change and energy supply security. UK has been implementing coherent policies in order to reduce the share of carbon emissions in the energy sector while securing supplies.

Since the measures to reduce carbon emissions contribute to enhancing supply security, the UK has been supporting the international cooperation on establishing a framework to tackle climate change. In addition to energy efficiency and renewable deployment, Government has been supporting new nuclear power stations and carbon capture and storage technology and low carbon technologies as well. UK recognises that the decisions on the energy sector taken today have long term effects due to the long lifespan of the energy infrastructures. UK also realises that in order to reach the long term carbon emissions reduction target while securely meeting the energy demand the policymakers, the energy industry and the public should collaborate.

## 6.1.2 Energy Import and Export

Energy exports and imports are simply based on production and consumption figures. If the production values surplus the demand, then the country can export the excess amount of energy. On the other hand if the consumption cannot be met by the production then the country has to import energy in order to meet its demand. The production sites and their feasible extraction potential and the consumption patterns are the drivers of import and export balance. Therefore UK energy import and export trend has been changing due to the new discoveries and the potential of these sites and energy demand since 1970s. While UK was net energy importer in the period from 1970 to 1980 and from 1990 to 1995, it was net energy exporter during the years from 1980 to 1990 and from 1995 to 2005 [35]. Nevertheless UK has been importing energy since 2004.

In 2004 UK was net importer of energy after being more than two decades of net exporter of energy [35]. Since then, the concern for the energy price and the supply security has been on the top of UK energy agenda. According to recent UK Energy Statistics, due to the declines in oil and gas production UK primary energy production decreased by 10.7% in 2012 compared to in 2011, while final energy consumption increased by 1.7% due to especially colder weather in 2012 [36]. Owing to the decisive renewable policies electricity generated from renewable sources increased by 19% compared to that of 2011 and UK generated 11.3% of its total electricity from renewable sources in 2012 [36].

UK gas production from North Sea is falling and the imports have been gradually increasing. The gas import is projected to rise to 80% by 2020 [37]. The gas imports directly affect the gas prices. Since gas consumption mostly depends on the weather conditions, especially in winter, gas generally drives the power prices. The rises and falls in gas prices have significant impact on energy bills. One of the main concerns of the Government is to cut the energy bills. Since fuel prices have upward trend, consumers in the UK are having difficulty in paying bills. Hence Government has been seeking a way

to solve the price problem while rebuilding consumer confidence. In this regard, the main objective is to reduce energy demand through efficient use of energy. In order to offset high gas prices by changing its energy policy, UK has been setting its electricity generation policy on mainly coal bearing in mind the carbon emissions from the coal-fired power plants. In 2012 39% of UK's electricity generated from coal and this was the highest share of all fuel types in electricity generation [36].

## 6.2 Natural Gas Market

In 1980s, UK was one of the countries that implemented the privatisation and maintained the free markets in order to promote competition to reduce the energy prices. UK energy market has completely changed due to the privatisation and liberalisation process. This process has brought the competition into the energy market. Competitive market benefits everyone by enabling to choose from a wide range of products with good service at a lower cost. More competition in the energy market results in better deals for consumers.

With the aim of privatisation of nationalised industries, natural gas sector has been entirely transformed in the UK since 1980s. Privatisation generates income for the governments and also expedites the development of private companies in order to increase the investment in the infrastructures. As a result of privatisation free market emerges and free market brings along the need of market regulations.

The main intention was to create a competitive environment in the natural gas sector in the UK. Therefore UK Government made legal arrangements to introduce several private companies operating in the sector instead of one public company. In order to realise that, third party access concept was accepted aiming to end the monopoly of the BGC and to create a competitive and fully liberalised market [38]. In this context first of all BGC was privatised and BG was established in order to promote the competition [38]. In order to end the monopoly, BG was entitled to transport the competitors' gas through BG's pipeline network [38]. The other change during this period was the establishment of the first gas regulator [38].

The main point of these changes in the British gas market was to end the monopoly and encourage the competition in the liberalised market; however unless the market share of the BG had been reduced, it would not have been possible to reach the sufficient competition level in the market. Therefore BG sold some of its gas to other suppliers in order to reduce its market share

[38]. The idea of unbundling was first emerged in order to separate main business divisions of BG. And then in order to bring the competition to the residential market, new licensing system established defining pipeline operators (Gas Transporters), wholesalers (Gas Shippers) and retailers (Gas Suppliers) [38]. These new changes and the decrease of the market share of BG enabled the creation of a fully liberalised gas market in the UK. There was a need to manage all the activities of the suppliers and transporters thus common set of rules for the players introduced with the accepted Network Code. It governs processes, such as the balancing of the gas system, network planning, and the allocation of network capacity [39].

The major aim is to create a business environment in which all customers independent of their consumption volume could choose their supplier and genuine competition at all levels of the supply chain could be well established. In this regard, UK has fully liberalised natural gas market. UK produces some of its natural gas from the continental shelf and imports some pipe gas and LNG. There are pipelines connecting UK with Norway, Holland and Belgium [40]. All these gas come to the terminals and enter into the national transmission system which has high pressure. Large end users can take gas directly from the national transmission system. From the national transmission system gas enters the distribution network which has lower pressure and provides the gas for small end users.

In the UK, actors of gas business have their own roles. Producers sell gas to shippers and shippers sell gas to suppliers in order to provide sufficient gas to suppliers' customers. Shippers pay the national transmission system operator and the distribution network operators for the capacity that is booked. Owners of transmission and distribution systems do not buy and sell gas; gas therefore belongs to shippers. Shippers own storage facilities in order to balance the supply and demand especially during winter. Market is the place where the gas is traded. Suppliers have long term contracts such as three or more years for huge volumes of gas [41]. Suppliers make profit based on the difference between the price they pay while purchasing from the market and the price they sell gas to the customers [41]. In the UK gas

price is not linked to oil prices which is the common practice for some countries. The gas trade in the UK market determines the price. UK gas market has enormous size thus it is the benchmark for other markets in the world. The price at the UK market is considered as index price for long term gas contracts.

In the wholesale markets, suppliers purchase gas for their customers. There should be a fair and competitive interplay between supply and demand to ensure that the final consumers benefit most. Competitive markets provide the best outcomes for the consumers. The prices are not fixed. The attempt to fix the prices by manipulating the market is against the energy market integrity and transparency principles. The ability of the consumers to choose their suppliers and tariffs among wide range of options put the pressure on the suppliers in order to offer better deals, services and innovative products. This enhances market competition and results in benefits for consumers. Liquidity is one of the indicators of a healthy competitive market. Liquidity can be simply defined as the ability of entry in the markets to promote the competition. High liquidity level of the market shows that competition is high.

## **7. Recommendations and Conclusions**

In the context of global energy policy, Turkish Government is fully aware of the energy issues and challenges and thus Government has been addressing all energy concerns in its agenda. Government has been setting its targets by taking into account of the supply and demand balance. Since Turkey has been dependent on import energy, Government targets in relation to the maximum usage of domestic sources and efficient usage of energy are considered appropriate. Increasing the share of renewable energy and decreasing carbon emissions are the targets towards supplying energy while protecting the environment. In order to diversify energy mix nuclear power plants will be constructed and this will enable Turkey to import less energy.

At present, Turkey almost fully depends on import natural gas since its production is not sufficient to supply its current and future natural gas demand. And this situation is likely to continue for some time. At the moment, Turkey has provided its gas supply security with the route and source country diversity. The infrastructure to transport and transmit natural gas is sufficient for now. However it is a wise policy to act right now in order to provide sufficient supply for the future needs since the current trend is not sustainable in order to meet future needs. In this context, the pipeline network expansion to cover all country and the establishment of additional storage facilities in order to provide backup capacity in the event of unanticipated supply shortfalls or high prices should also be considered.

There should be holistic approach in the natural gas business. From well head to the end users all parts of this business require sufficient infrastructure capacity and sufficient competition at all levels in the business. Fully liberalised and mature market is not the concept to be reached in the short time. It requires coherent and achievable targets therefore the ongoing studies and discussions on the Natural Gas Market Law in order to amend to set achievable targets will result in maintaining more competitive market.

Greater natural gas market integration depends on several factors. The transportation of natural gas is mainly conducted by pipelines. These pipelines in general are constructed via transit countries and in these cases the transportation of natural gas to the consumer is no longer the issue of only the supplier and the consumer. In these cases transit countries are in the business as well. Within this perspective, Turkey has been presenting a good example of transit country with all its transit pipelines in operation. Another factor is the competition for the natural gas since the global demand is high and the global supply is concentrated in certain areas. In this context, Caspian and Middle East regions are significant resources for the countries which are rely heavily on imported natural gas to meet their demands. Within this perspective, in addition to the proximity of Turkey to these regions, Turkey has another advantage of pursuing advanced energy diplomacy in these regions. Moreover thanks to the long term natural gas business relationship between Turkey and these countries, Turkey has established an excellent reputation as a reliable partner. In fact, these factors constitute the opportunity for Turkey with all its advantages to establish more competitive natural gas market and natural gas trading hub in its territory. Even though all these facts have already ascertained by the Government and the target to develop natural gas trading hub has already been set, the process of progress towards desired level has been relatively slow.

Since the maturity and size of the natural gas markets vary in the regions, in general world natural gas markets have distinguishing features. Gas on gas competition and pipeline access can be observed in the US and UK market and these markets minimise the risk through spot market. On the other hand, European markets are mostly managed by long term contracts and prices are linked to oil. In addition to the distinguishing features of the natural gas markets, the transportation of natural gas by pipelines increases the delivery cost and therefore natural gas price varies in the different regions of the world. This price differences force buyers into renegotiating their natural gas purchase contracts in order to benefit from lower prices. A liquid natural gas market is beneficial to Turkey and its economic interests and, at the same

time, advances security interests through diversity of supply and resilience to disruption. The hub is the physical or virtual point where the natural gas sellers and buyers meet in order to trade natural gas. This trade determines the price of natural gas, thus allowing the hub to become the referencing point for the gas price in the region. Being natural gas trading hub enables Turkey to become referencing point for the price.

Natural gas market has been in the growing stage since 2001. Natural gas demand has been increasing in Turkey. These are the significant signals for the need of the establishment of the liberalised natural gas market and natural gas trading hub. In this context, some structural changes as planned should be implemented.

Simply in line with the British gas market change process, BOTAŞ is entitled to sell some of its gas to other suppliers in order to reduce its market share however even though BOTAŞ gas release action is considered to be a right decision, the pace of gas release is relatively slow since during last 10 years 25% of the market share is released to private companies. There is a need for open and transparent market with no price controls and the price should be determined by the forces of supply and demand.

While the Government has established the electricity energy market and supply security strategy and has been actively pursuing its aims, natural gas market reform strategy has not yet been established and therefore the progress in order to enhance the competition in natural gas market is relatively slow.

Government has been requesting sector reviews from relevant bodies when amending the legislations on natural gas market and hub system. Whilst this is regarded as a positive attitude in terms of taking into account the fundamental aspects while structuring the plans, strategies or legislations; it would be also significant to take extensive range of opinions of the active players in the sector and to evaluate and implement these opinions at the earliest possible time.

As seen in the global models, the trend towards a competitive market is to privatise and separate the main businesses departments from the main company. Even though Turkey is fully aware of this fact, the unbundling process is not sufficient. BOTAŞ is still the dominant player in the market. Government should establish a road map covering the targets for the short, medium and long term.

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