



SHALE GAS POTENTIAL IN TURKEY AND ITS ROLE IN WORLD ENERGY MARKETS

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Abstract

While the search for new and renewable sources are still continuing today it is approaching the great shortage of energy. In this regard, renewable energy resources creates some problems to companies who are active in energy sector, with new infrastructure and high investment costs. For this reason the companies are insistent to not to change experienced and conventional methods. Shale gas which seen as a new source and require high technology for removal will be come up a significant actor in energy sector. Especially in the USA, the world shale gas has being removed since 1995 and has a good alternative potential to natural gas. A significant portion of shale gas is based on USA and the follower countries are follows its developments closely like China.

Shale gas quality characteristics similar to natural gas in terms of energy and there are various methods for its removal. Especially the European countries are cautious to extraction. The reason is the possibility of contamination of ground water in processing time and cause threat for ecological balance. On the other hand another debate about hydraulic fracturing method has possibility to activate the fault line.

Recently the shale gas has come into question in Turkey and according to various studies there is a considerable reserve. In this context, TPAO and foreign investors has begun to search and clearer information about the reserve will emerge soon.

Keywords: Shale gas, natural gas, alternative energy resources

TÜRKİYE'DE KAYA GAZI POTANSİYELİ ve DÜNYA ENERJİ PİYASASINDAKİ ROLÜ

Özet

Enerji konusunda büyük sıkıntıların yaklaşmakta olduğu günümüzde yeni ve yenilenebilir kaynak arayışları süratle devam etmektedir. Bu açıdan bakıldığında yenilenebilir enerji kaynaklarının yeni altyapı gerektirmesi ve ilk yatırım maliyetlerinin yüksek olması enerji piyasasında faaliyet gösteren şirketler için bir dezavantaj oluşturmaktadır. Bu nedenle şirketler klasik ve tecrübeli oldukları yöntemleri değiştirmemekte ısrarcıdır. Yeni bir kaynak olarak görülen ve çıkarılması için yüksek teknoloji kullanımı gerektiren kaya gazı gelecekte enerji piyasasının önemli bir bileşeni olarak karşımıza çıkacaktır. Dünyada özellikle ABD'de 1995 yılından beri çıkarılan kaya gazı doğal gazla önemli bir alternatif olma potansiyeline sahiptir. Dünyada çıkarılan kaya gazının büyük bir bölümü ABD kaynaklıdır ve Çin gibi takipçi ülkeler ABD'de izlenen politikaları yakından takip etmektedirler.

Enerji niteliği bakımından doğal gazla benzer özellikler taşıyan kaya gazının çıkarılmasında çeşitli yöntemler kullanılmaktadır. Özellikle Avrupa ülkeleri kaya gazı çıkarılması hususuna son derece temkinli yaklaşmaktadır. Bunun sebebi ise yer altı sularının proses sürecince yüksek kirlenme ihtimalinin ekolojik yapı için bir tehdit oluşturmasıdır. Diğer yandan hidrolik çatlatma yönteminin bazı fay hatlarını etkileyerek aktif hale getirebileceği tartışma konusu olmaya dem etmektedir.

Anahtar Kelimeler: Kaya gazı, doğal gaz, şeyl gazı, alternatif enerji kaynakları.

1 Introduction

Since the day human started showing his existence on earth, each individual needs an energy requirement. The claims over run out of resources which is a disaster for humanity in the near future. Such developments experienced and begined new resource searches in the World, the presence of shale gas has known for many years seen as a solution by some authorities. US, Russia, Canada and China aimed to supply the half of energy consumption with this way in 20 years. [1]. So far, the US has 99% of wells drilled and the gas is produced in the United States around 90% [1]. EU (European Union), largely depend on

outside on energy, on the one hand to reduce the public's environmental concerns on the other hand the search for cheaper energy sources.

Renewable energy sources like wind and solar that will significantly contribute to the reduction of pollutants and greenhouse gas emissions, are in the risk of losing popularity with a possible increase in production of shale gas production. Yet there is no clear information about shale gas reserves in the world. This is why there is a need to improve the drilling and estimation methods. According to the course shale gas will continue to be one of the main item of the energy debate in the world. In this case, Turkey who want to take steps about

importing a large amount of energy will become clearer in the coming days and reveal how results in. [2] (Figure 1).

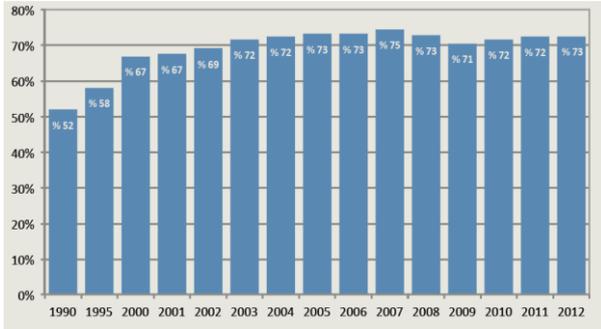


Figure 1. 1990-2012 The Rate of energy needs with imports in Turkey [3]

Despite the acceleration in domestic gas production, the level of consumption rate to production is approximately 1.5% caused to search new resources in Turkey.[3].

2 Material and Method

Shale gas containing structures which is one kind of fine-grained sedimentary rocks, are formed as a result of compression underground called mudstone, small mineral particles such as silt and clay. The difference between shale gas blocks and others is fragileness and film formation underground. The formation of oil and gas in these rocks takes 200 year period. Oil and gas may not be present in each layer of shale. In general, the possibility of oil and gas in the gas layer of black rock is very high. (Figure 2)



Figure 2. Examples of different types of rocks, shale gas [1]

Oil and gas are placed in different rocks separating from bedrock. However, a portion of the oil and gas during this displacement remains in the bedrock. And the gas which does not displace and remains in rock pores is the shale gas.(Figure 3)

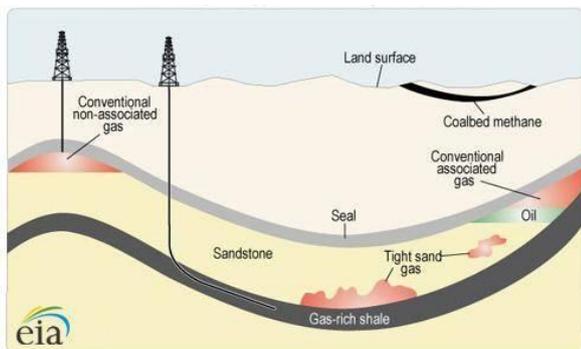


Figure 3. Overview of shale gas resources [1]

Drilling The Shale Gas: Today shale gas reserves are identified and removed the long-term and expensive method of working with hydraulic fracturing. In horizontal drillings done at specified levels with using high pressured and at the rate of %99 water-sand mixture vertical cracks are made, and thus the flow of oil and gas wells are provided. To avoid contamination of groundwater resources, high pressured water injects to kilometers of underground in steel pipes. Certain chemicals participates into the water. The mixture of sand, is used to make cracks and continue to keep an open flow [4].

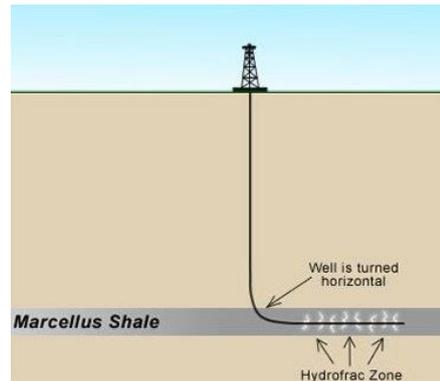


Figure 4: Hydraulic Fracturing Method [1]

The estimations about Turkey's gas reserves are between 500 billion and 1,8 trillion.[1]. This reserve is equivalent to 30 years requirement. Recently Turkey Petroleum Corporation (TPAO) and Shell, began to shale gas exploration in Diyarbakir Silvan [3]. Saribugday-1 pilot Project is significant for determination of shale gas reserves. Approximately 12.5 km² area were initiated to reserve determination. This study is planned to be completed by the end of 2015. Work will continue until it reaches bedrock and location of gas seems to be produced. According to U.S. Energy Information Administration report of 2011, the reserve of Turkey's detachable gas is about 424 billion m³. [1]. On the other hand, in the research formed the report source Turkey's at present geological and seismic data lead to give weight to the Thrace Basin and Southeastern Anatolia. According to geological estimates, Turkey has the basins that not yet sufficient explorations particularly in Central Anatolia basin. Therefore, the reserves calculated in the current situation is expected to be increase with the acquisition of new geologic and seismic data.

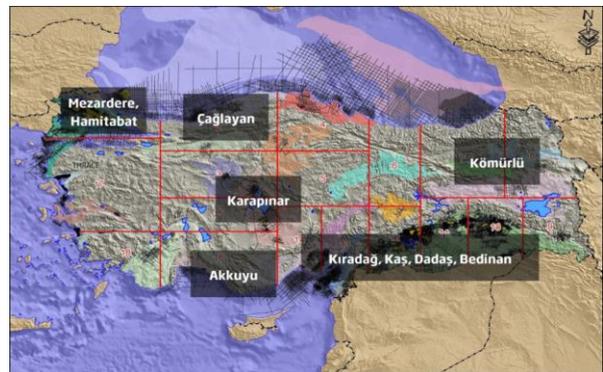


Figure 5. Turkey Regions that shale gas can be produced [1]

It is known that depth and thickness of shale gas in Turkey is suitable for economic production with its convenience to hydraulic fracturing. Common natural gas distribution network

and existing legislation is important to promote the production of shale gas investment. The basis of legislation for shale gas production in Turkey is the Petroleum Law 6326 and issues related to hydraulic fracturing for shale gas production and waste management is regulated with this law. Study on the assessment of shale gas potential in Turkey have been initiated under the leadership of TPAO. In this context, exploration and production agreements were made with the USA based firm Transatlantic Petroleum in 2010 and in 2011 with Shell. The other companies that began exploration studies are Exxon Mobile cooperated with Çalık Group. TPAO is planning to begin shale gas explorations on their own fields. Apart from these companies there is several interested and initiative companies that carrying out feasibility studies for the industry. In case of a positive result of the initiative of major oil companies like Shell and Exxon Mobile it is understood that interest will increase to the sector. According to the research made by TPAO, shale gas existence determined in *Diyarbakır, Erzurum and Thrace*. [3]. Recent studies revealed that there is potential presence of shale gas in Turkey. Preliminary studies were initiated to determine this potential (About 500 billion m³). Because the reserve in Thrace is so small, TPAO and Shell Upstream Turkey B.V. were decide to start first shale gas production in Sarıbugday area. If it continues to work as expected, the production will start in 10 years with one year preliminary, 2 years exploration, 2 years assessment, 3 years development [3].

3 Research Results

There is several obstacles that need to overcome in Turkey for shale gas production [5]. These obstacles are;

Environmental: Aside from the risks that may occur during drilling, likewise most hydrocarbon derivative shale gas has both combustion product and direct emitting risks can't be ignored for causing greenhouse effect.

Geographical: Unfavorable conditions such as landowners and geographical barriers may cause obstacles for exploration and drilling operations.

Technological: Technological incompetence and inexperience of shale gas activities emerges as one of the biggest obstacles in Turkey. [6].

Pipeline: Oil and gas pipelines in the United States who began to shale gas production (approximately 500 000 km) cannot compared with Turkey [7].

According to researches and experts comments, shale gas production takes at least 10 years. The shale gas gained importance so that Turkey meets own energy requirement with importing. On the other hand with new seismic data Turkey's reserves may increase. Although at an early stage operation for the production of shale gas in Turkey has gained importance.

4 Results and Discussion

Both the changes may occur in the World and the potential in Turkey, the developments will take place in the first ranks of the agenda. In order to strengthen Turkey's hand, spread of investments and domestic production are so significant.

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