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New Energy Eco-Politics: Shale Gas Evoluation

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ABSTRACT

Recent development in production techniques unlocked proven shale gas reserve in the U.S and it is estimated that proven reserve will provide additional 100 year supply to U.S. This energy event called shale gas revolution. This revolution will change every thing related to energy perception. This paper will examine importance of shale gas in global energy mix and its excepted route for Countries and Regions. Economic and political impact of shale gas for classical energy supplied and demanded countries will also analyze.

***Keywords*:** shale gas, Energy security, energy economic and politics, energy producer and consumer countries and regions

Yeni Enerji Eko-Politiği: Kaya Gazı Deverimi

ÖZ

ABD' de var olan kaya gazı rezervleri son dönemde üretim tekniklerinde meydana gelen gelişmeyle birlikte artmaya başlamıştır. Tahminlere göre ABD'deki kaya gazı rezervleri ABD'ye 100 yıllık ek enerji arzı sağlayacaktır. Bu enerji olayı kaya gazı devrimi olarak adlandırılmaktadır. Bu devrim enerji ile ilgili her hususu etkilemekle birlikte bilinen bütün algıları da değiştirmiştir. Bu makalede kaya gazının küresel enerji arzındaki önemi ve beklenen gelişimi ülke ve bölgeler açısından incelenecektir. Ayrıca bunun ekonomik ve politik yansımalarını arz ve talep eden ülkeler açısından analiz edecektir.

Anahtar Kelimeler: kaya gazı, enerji güvenliği, enerji ekonomisi ve politikası, enerji üretici ülke ve bölgeler,

Global energy supply was getting crucial point for international issues, economy and politics. Easy reach to sustainable energy source was defined as energy security and the concept of energy security was also confusing vital concept especially for United States, European Union and energy dependency developed countries. On the other hand, rapid global expansion of income and population is driving up global energy requirements while energy supply becomes tighter (BIAC, 2012:1). The recent and expected future expansion of North America shale gas (unconventional gas) production has a significant role for the global natural gas market and the geopolitics of natural gas in Europe, EU and other energy dependency countries.

World is going to more intensive relation for supplied countries and demanded countries for energy. Although, this mutual relation concluded as reciprocal dependency for both sides, supplied countries such as Russia try to obtain political benefits and use energy as superiority to energy dependency countries. Energy dependency of EU and U.S to Middle East, Russia, North Africa and Central Asia are on delicate and fragile ground. Most of the energy-rich regions and countries such as Russia and Middle East have politic and economic instability or are quite eager to get energy-related political supremacy. Thus, energy dependence affects the U.S and EU policy. However, Energy dependency of EU and U.S also has influence to policy making process for many global matters such Russian military intervention and orange revolution in Ukraine. Because, energy makes energy dependency countries more careful for their policy implementation. But, the significant growth in the production of natural gas from shale formations constitutes one of the most relevant developments in the energy sector which was started from North America (Paolo D. Farah and Riccardo Tremolada, 2013 :2).

North America's total natural gas consumption was 828 billion cubic meters (Bcm) and total production was 812.95 Bcm according to data of BP's Statistical Review 2010 in 2009 and North America imported 42 percent of its natural gas from Trinidad and Tobago and 29 percent from Egypt. When we look at the data for EU, stronger energy dependency market structure is consisted. More than 50 percent of natural gas was imported. Russia is the largest supplier of natural gas to Europe, with a 62 percent share of imports (BP: 2010).

Energy security and benefits accrue to all gas importing countries as a result of new shale developments in the United States and Canada (Kenneth B. Medlock, 2009:3). With the shale gas development, world energy demand and supplied composition is changed. Thus, this energy is called revolution. This new type natural gas form which is also called unconventional natural gas is not only changed world energy balances also have potential to shift the energy balances from Middle East and Russia to the North America. Rising shale gas production in the United States is already impacting markets abroad. However, if the China gets the technological innovation for extraction working for shale gas, this will be energy revolution for Asia. China may eventually produce more shale gas than any other countries. According to some estimates it has

the world's biggest reserve. U.S, EU, Chine and Latin America will change the energy game with shale gas and will heart of the energy sift? These questions are common in every countries' energy policy agenda and shaping their international politics.

SHALE GAS AND Its' GLOBAL IMPORTANCE

To understand world energy outlook and changes in energy supply and demand structure for recent period, we need to analyse new energy form. This energy form emerged in United States firstly with the technological innovations and have potential to expand to all over the world. The new energy form is shale gas. Energy outlook of all worlds is changing with shale gas. This changing impressed both supply and demand side for energy and international politics and economy. Customary energy perception will remain past and new pages for energy will open. Shale gas will change energy demand and supply composition and energy security perception for most of the country.

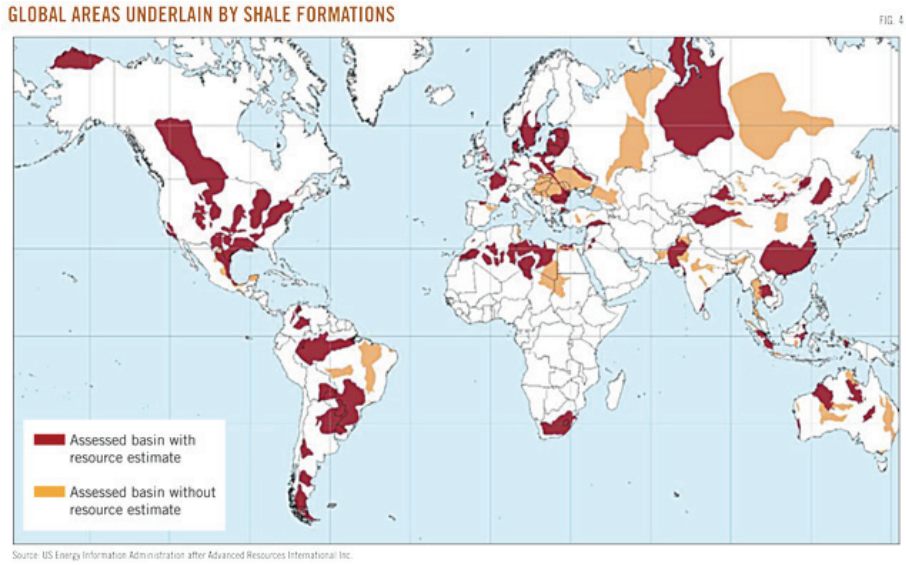
The more than doubling of our natural gas supply is a truly disruptive change in what had been a relatively stable energy supply outlook (Marks S.Lıpshultz, 2012 :20). World energy outlook deeply changed with shale gas and affected almost all countries' energy policy. In fact this is energy revolution. Shale gas refers to natural gas that is trapped within shale formations. Shales are fine-grained sedimentary rocks that can be rich sources of petroleum and natural gas. Over the past decade, the combination of horizontal drilling and hydraulic fracturing has allowed access to large volumes of shale gas that were previously uneconomical to produce (IEA: 2013).

Production of unconventional gas has been ongoing for many decades. But, it was too difficult to mention about significant production for that period. Efficient production of shale gas has only recently gained prominence mainly due to the success of shale gas in the United States. Technological advances in horizontal drilling and hydraulic fracturing has improved the cost effectiveness of shale gas production which is transformed the US energy future and providing historical opportunity for all aspects. Although, shale gas is giving to revolutionary opportunity for energy dependency countries, some negative impact of shale gas originated from production process is hot topic for countries' environmental security. Environmental aspect of Shale gas production is still debating. Production process of involves the use of chemicals, which environmentalists fear may contaminate local water supplies. Even though these concerns have yet to materialize several countries have decided to impose moratoriums on shale gas production until further studies for more environmental method developed (BIAC, 2012:3).

Process of shale gas production is concluded as costly procedure depending on field' geology and productivity. United States is successful to minimize costs for production process but this success may not be easy to replicate in other part of the world.

Technological revolution of United States carried out shale gas energy revaluation in the world. Other part of the world need to innovative solution to reach successful production but it will take time.Unlike, unequal oil and natural gas distribution among the region and countries, shale gas has more balanced outlook. The global shale resource base is thought to be huge and widely spread.

Figure 1: Global Area Underlain By Shale Gas Formation



Source: U.S Energy Information Administration After Advances Resources: http://www.ogj.com/articles/print/volume-111/issue-12/exploration-development/shale-gas-and-oil-fundamentally-changing-global-energy-markets.html

The EIA assessment from 2013, covering 41 countries, estimates the technically recoverable resources of shale gas at 186,000 mote, about as much as global proved gas reserves. China accounts for 15% of this total, Argentina 11%, Algeria 10%, US 9%, Canada 8%, Mexico 7%, Australia 6%, South Africa 5%, and Russia 4%. Brazil, Venezuela, Poland, Ukraine, France, and Libya also have a significant resource potential[1]. The picture has been expressing that energy dependency North America and Latin America are becoming main natural gas producer countries. In addition to America, Asia has abundant shale gas reserve. Specially, China has been hold 15% of total shale gas reserve in the world. Rapid economic growth and income is resulted as more energy consumption. This is the main economic and politic limitation for U.S,

1 GEA, "Global energy assessment: toward a sustainable future," Cambridge University Press, UK, 2012.

EU and China. Shale gas revolution changed their posture for economic and political aspect and also reduces prominence of main energy producer country and regions (GEA, 2012:38).

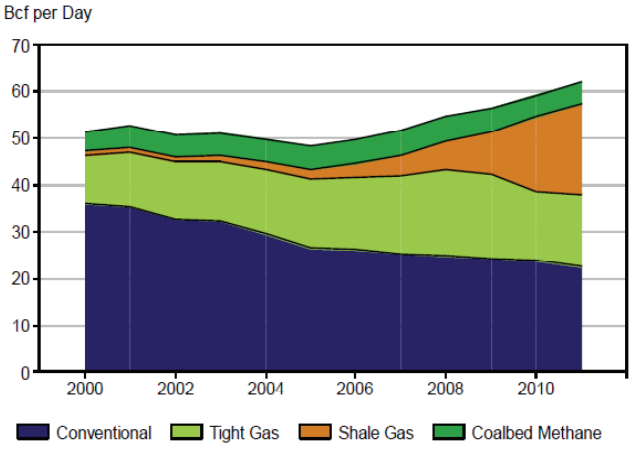
SHALE GAS IN U.S

United States Shale gas revolution not only impact domestic energy composition, but also impact to customary global energy structure. Beginning with the Barnett shale in northeast Texas, the application of new techniques involving the use of horizontal drilling with hydraulic fracturing has resulted in important rising for shale gas production. Technical innovation is reduced cost and make shale gas more commercial for also private sector in U.S (Kenneth B. Medlock, 2009 :3) .

History of shale gas production which is changed energy import and export composition is very new. U.S domestic natural gas production was decreasing and import dependency to natural gas is increasing only five year ago. The standard view held that domestic production would inevitably decline and imports would consequently rise However, It was estimated that U.S would be become one of the world 'largest LNG importers and many investment was generated to increase regasification capacity. Although shale gas had been explored in the U.S since the 1940s, recent technological advances have changed its place in U.S market. Unconventional oil and natural gas activity is already revolutionizing America's energy future and bringing enormous benefits to its economy. Based on shale gas extraction process will generate millions of jobs and billions in government receipts. With the recent development of technological innovation which allowed for shale gas to be produced more cheaply than gas from conventional sources is shifted energy from conventional natural gas to unconventional shale gas (Farley and Williams, 2013:1).

Unconventional natural gas production after new technological development is now reshaping domestic sources of supply of United States. A dozen years ago, shale gas production was only 2% of total US natural gas production. Today, it represents 37%. Transformation of abundant unconventional gas to natural gas in U.S also impact to prices. It is estimated that more stable and cheaper natural gas will be available for manufacturing. This situation will support manufacturing and will ensure comparative advantages for U.S against other countries. In addition to impact of shale gas revolution on supply and demand composition, however shale gas development has become an engine of job creation and economic growth. In 2012, 1.7 million jobs and will generated by unconventional gas industry and it is estimated that the end of the decade almost 3 million jobs will be generated (HIS Report, 2012 :2).

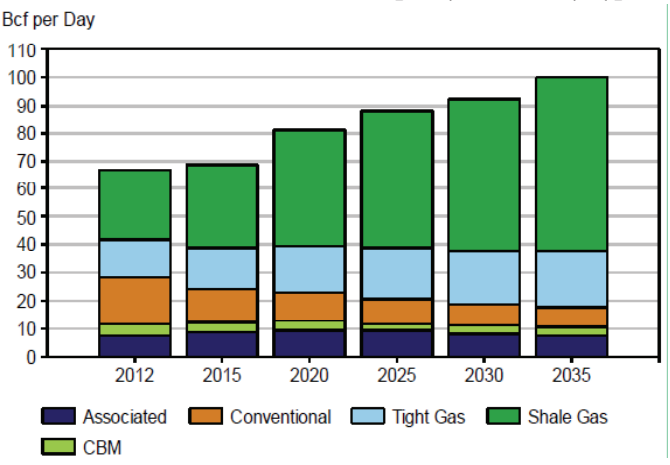
Figure.2: US Lower 48 Natural Gas Productions by Type: 2000 to 2011



Source: Energy Information Administration, HIS CERA

According to figure 2, the ratio of conventional gas is falling proportionally. Especially middle of 2008, the shale gas production ratio had increasing sharply. IHS CERA expects total domestic natural gas production to continue to grow over the long term, in line with expanding natural gas consumption. Almost all of the future growth of US natural gas production is expected to come from shale gas and tight gas plays. By 2035, total natural gas production is expected to approach 100 Bcf per day of which nearly 80% will come from shale gas and tight gas alone (HIS Report, 2012 :3).

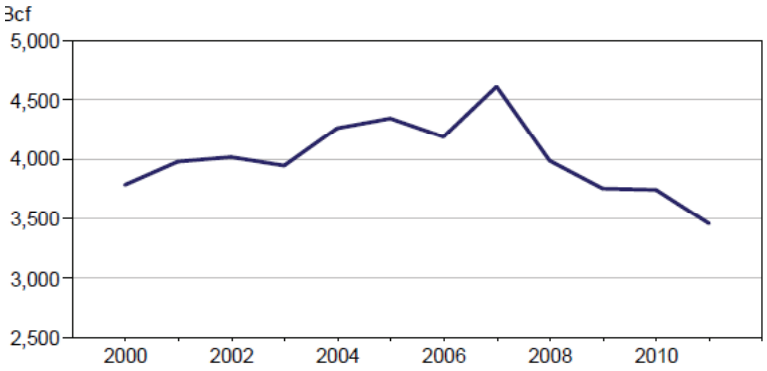
Figure 3: U.S Lower 48 Natural Gas Productive Capacity Outlook by Type: 2012 to 2035



Source: IHS CERA

The data is expressing that after 2015 shale gas will be dominant energy resources and the U.S will need minimal LNG imports to balance supply with demand. Instead of debates over US imports, there is a discussion today about exporting some of the domestic surplus, as well as the potential for using natural gas in some classes of vehicles.

Figure.4: U.S Average Annual Natural Gas Net Import: 2000 to 2011



Source: EIA 2012

Doubtless, Net gas import of U.S is decreasing and will continue to fall. Reducing import dependency is resulted as more strength energy security energy consuming countries. North America shale gas production reduce to dependency of energy supplied countries and reshaping their international policy also for EU Because, the production –to-consumption ratio for Europe was 0,49; thus, more than 50 percent of the natural gas consumed in 2009 was imported and the Russia was the largest supplier of natural gas to Europe. The natural gas import dependency was %62. Russia does not to hesitate use energy as political tool for its international relations (Cıgerli, 2013:7).

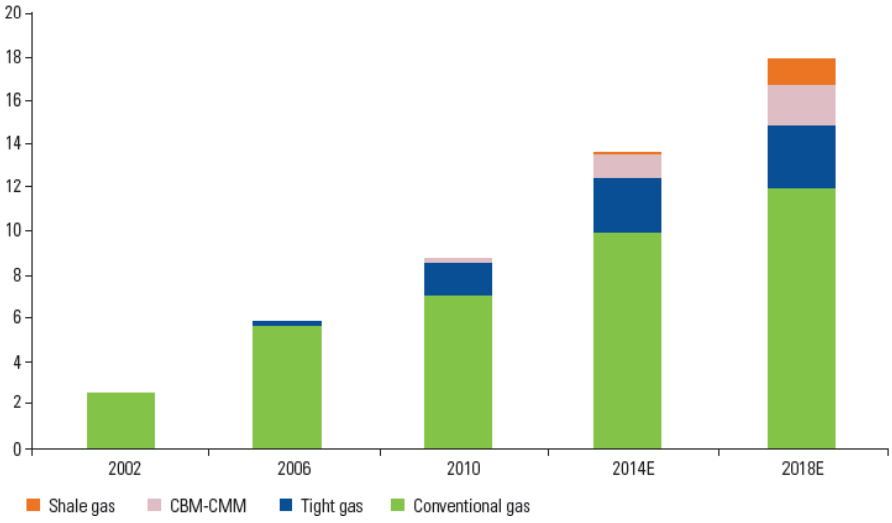
Shale gas revolution has been transforming the American's energy supply picture and giving a opportunity for also economic grow, reducing energy import dependence and enhance national security, lower household energy bills, reduce emission, and spur a manufacturing renaissance. Energy supply picture of other shale gas countries will be changed and its spillover affects has back demand to redraw energy policy and international politics ((Marks S.Lıpshultz, 2012 :4).

SHALE GAS IN CHINA AND OTHER COUNTURIES

China has been growing economy. Economic growth of China impacts world trade balance and also energy balance. Because, energy dependency of China has been increasing %150 depending on enormous economic growth of China in last ten years. Thus, China is focusing on diversification of its energy resources by increasing pipeline construction with energy rich region such as Russia, Iran, Caspian region and

also Africa, and China also trying to increase ratio of renewable energy resource rate in total energy demand. But shale gas revolution changed China energy Outlook. In fact that China has abundant energy resource but there is still inadequate production because of inefficient technological innovation for extraction process. A natural gas import of China is about %25 in total demand and it is estimated that the ratio will peak at 40 % in 2016-2018. As a result of shale gas success, it is estimated that import will be decreased to 25% of demand by2030 (SCOUT Report, 2013:7)

Figure 5: China Domestic Gas Production-billion cubic feet per day (bcf/d) 2002-18



Source: ' Unconventional Gas in Chine,Spiring 2011', Chine Greentech Initiative, http://www.chinagoabroad.com/sites/default/files/v1_attahments/2012/04/CGTI2011-CCE-WS1-Unconventional-Gas.pdf,

As it is understood from graph that ratio of conventional gas will increase continuously in total domestic gas production, although insufficient technological level for shale gas extraction.

Although the shale gas industry in China is still in its infancy, Chinese authorities have set an ambitious strategy for its development because of huge energy demand (Gawlikowska and Gradziuk, 2013: 1). In the world rankings of technically recoverable shale reserves, China is placed third for shale oil (at 32 billion barrels) and a clear first for shale gas (31.6 tcm) China's future growth will mainly come from unconventional gas (IEA,2013). In 2009 China and US signed an agreement designed to help China measure its shale gas reserve, encourage 'technical co-operation'. Because China technology for shale gas extraction is still behind western companies, thus China will

not wait for maturing its technology because of huge energy dependency and growing energy demand (The Economist, 2011: 6).

Several other countries are actively exploring the shale oil and shale gas resources available within their borders. The term technically recoverable resources correspond to the quantity of natural gas that could be produced with present technology, regardless of the costs associated with production and oil natural gas prices. Table has been showing that Continental America and China hold the most of the shale gas reserve in all over the world (IEA, 2013:3).

Figure 6: Top Ten Counties with Technically Recoverable Shale Gas Resources

Rank	Country	Shale gas (trillion cubic meters (tcm))	
1	China	31.6	
2	Argentina	22.7	
3	Algeria	20	
4	US*	18.8	32.9
5	Canada	16.2	
6	Mexico	15.4	
7	Australia	12.4	
8	South Africa	11	
9	Russia	8.1	
10	Brazil	6.9	
	World Total	**207**	**221**

* EIA estimates used for ranking order. ARI estimates in parentheses.

Source: EIA, Technically Recoverable Shale Oil and Shale Gas Resources, accessed http://www.eia.gov/analysis/studies/worldshalegas/

Argentina's significant potential is making Argentina second biggest shale gas reserve countries. Substantial infrastructure developments related to shale gas are helping to expand opportunities for both domestic consumption and export.

In Europe, recent studies have shown that, unlike the US, Shale gas deposits are generally located in deeper geological strata and the basins (Farley and Williams, 2013: 4). Europe has 639 trillion cubic feet (around 18 tcm), compared to the US's reserves, which are 862 (24 tcm). The 2050 Energy Roadmap published by the European Commission in December 2011, acknowledges shale gas as an energy source that could potentially lessen the EU's import dependence and play an important part in the EU's energy mix going forward (Zelennovskaya, 2012:4). But Europe shale gas production still under the US.

RESHAPING OF ENERGY ECO-POLİCY

What will be happen if full shale gas production is available for reserve countries? This question deeply debated all policy makers of international politics. Could shale gas help to improve energy security of certain centuries? Will Middle East, Russia, Caspian Region, North Africa and Latina America continue their importance in world energy policy? Will energy use as political tool against of energy dependence countries? Will energy oriented clashes on energy rich region go on? Doubtless, shale gas revolution holds opportunities and risks for classical energy perception of supplied countries and producer countries.

Political and economic balances are changing and state and region started to reshape their energy security perception with shale gas revolution. Classical perception energy for US and EU is changing also. By the contrast assumption on more energy dependency for EU and US, shale gas exportation is debating among them. One another point is especially more meaningful that China, as the world' fastest growing energy consumer focusing on shale gas production to meet fully its energy demand. China has biggest shale gas energy resources in the world.

With the innovation and growth in shale gas production, significant energy revolution has been generated new world economy and politics. OPEC, Russia and Iran energy' dominance was getting stronger before shale gas revolutions. The emergence of shale gas limits the energy dependency and near-term possibility of successful natural gas cartel by increasing the elasticity of natural gas in countries outsides and reduces monopoly power of Iran, Russia and Algeria among others.

Shale gas developments will significant impact on regional production, demand and pricing. Classical demand and supply approach for producer and consumer countries and region is reshaping with shale gas revolution which has major impact to Russia. Shale gas revolution will be weakening of Russia's position in Europe over time. Russian natural gas export will be increase but not in Europe mostly to Far East Asia with the development of pipeline. The dramatic lessening of Europe' dependence on Russia will be resulted as reducing Russia' ability to use energy as 'energy weapon' to Europe. It found that Russia' share of Europe's gas market (excluding former Soviet Union) would decline to 13 percent by 2040, from 27 percent in 2009 (The Economist, 2011:26) With the support of US, EU will obtain stronger position to evaluate and intervene such as political issues such as Georgia and Ukraine without intervention of Russia. EU and U.S coalition on shale gas will common support policy implementation all over the world.

Shale gas revolution also has impact on multinational pipeline construction such as Nabucco. The project will provide 1.1 tcf gas from Middle East and Caspian Region to Europe (Kenneth B. Medlock, 2009:8) But shale gas revolution makes it less feasible aspect of geopolitical and commercial sense. Timing is another obstacle for Nabucco. The construction process of Nobucco will not be complete before 2020s and these

years will be year of shale gas production. This project will loss its energy importance relatively and will take a kind of economic interaction role between Caspian region, Middle East and Europe.

Shale gas give opportunity to produce more domestic gas for US and EU and this is make it impossible for Iran to get revenues from natural gas export. China also will obtain shale gas from its abundant reserve and will reduce energy dependency to Middle East Suppliers and Iran. Totally, world dependence on Middle East natural gas remains below 20 percent until the late 2030s (Kenneth B. Medlock, 2009:1)

CONCLUSION

As shale gas commercial production is underway in the North America, it is likely that production will soon begin in other parts of the world. Shale revolution will play significant role for countries both politically and economically. Aspect of economic dilemma, Classical energy producer countries such as Russia, Middle East and North Africa will accept more stable energy prices and revenue that will limit their economic growth. Classical energy demanded economy such as U.S, EU and China will affected positively from shale gas revolution. The development of shale gas in China and other shale gas reserve countries will likely depend on several factors: local reservoir characteristics; technology transfer and innovation, commercial considerations such as infrastructure vailability and regulatory environment, applicable rules and laws governing water use (Fan Gao, 2012:9). Shale gas production will ensure economic contribution and stability. They will not have to receive expensive energy imports which contribute to the debilitation of their currencies. Increasing domestic gas production will provide also economic stability and create jobs for millions of people and also it will be a kind of economic integration tool for EU, US, China and Latin America and strengthen their economy.

Gas producer countries such as Russia, Iran and Venezuela will loss their political influence on global energy mix. By the contrast U.S and EU will imply their international policy on global issues independently from energy. Political and economic benefits of shale gas are obvious but Environmental issue such as governing water is still debating. Technological innovation will be available for all countries at the beginning of the 2020.

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