Shale Oil
Feasibility of Production and Future Challenges

Report

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Nov. 2015
Introduction

Shale oil, produced in the United States, managed to rapidly develop within a decade and occupy an important place in the world’s oil market, in addition to competing with fossil or traditional oil production, overthrowing oil prices on the global level and causing a significant deficit to the budgets of countries producing conventional oil. Despite the important role of this oil, mystery still surrounds this fledgling industry. Analysts in the field of energy do not expect the question of the collapse of shale oil production to arise, in light of the decline in international oil prices, as a result of the support received by producing companies from major oil companies and global private equity, which will ensure that shale oil remains a key player in global oil markets during the coming period. However, they stressed that many US exploration and production companies will probably not hold up for many years because of high production costs. Rather, only companies that have high financial capacities will survive. So far, US shale oil could respond to the drop in oil prices, but any sustained improvement in prices will also encounter instant increases in shale oil production. Information indicates that shale oil currently represents 51% of the total US oil production, and is its main source of annual growth from 2008 to date.

There are several questions on the minds of observers on the issue of shale oil, including: how much production in North America will fall because of the deterioration of prices? What is the availability of shale oil reserves outside North America? How they are developed? How would shale oil meet needs of consumers in producing countries? Will companies producing shale oil face a difficult test?

We will try to answer these questions in the next few pages.

What is Shale Oil?

It is a type of light oil, produced from rocks containing kerogen deposits that are converted by heat to liquid hydrocarbon, an alternative to crude oil. Shale oil is a solid compound of organic emergence that is formed in aqueous conditions.

Geologists define it as sedimentary rock, mainly formed of organic materials (fossil animals and marine and river creatures) that make it similar to crude oil. It usually consists of a thin viscosity. When shale oil is heated in the absence of oxygen, we have liquid or gaseous hydrocarbons, and the new material formed due to heating in the absence of oxygen represents only 20-70% of the initial volume.

In spite of the evolution of techniques used in its extraction or production, the cost of extraction is still higher than that of traditional crude oil - being locked up in deep rocky layers. The United States is seeking to become the largest oil producer in the world by 2017, through the development of shale oil production techniques, surpassing the production of KSA - or to reach self-sufficiency in oil due to shale oil by 2020. Possibly, it can turn into an oil export. This feeling does not only entice the United States, but also entices developed and developing countries alike.
Importance of Shale Oil

Before World War II, shale oil was used as fuel for transportation. Subsequently, it came to be used as raw material for a variety of chemical materials, pure chemicals and industrial resins. It was also used as a preservative for wooden railway sleepers in the construction of railway lines. However, its uses took another turn from the beginning of 2008 to the present, as it became commonly used in central heating - and to a lesser extent in the production of various chemicals. A boom in shale oil production is expected, to surpass that of the United States, and this will result in restoring many of the industries that migrated there in the past from countries such as Argentina, China, Russia, and Australia, due to higher production costs. This is inevitable once they are able to develop techniques used in its production thereby increasing it on average by more than 40%. This will lead to higher availability of global shale oil. Some experts predict that oil prices will fall in United States, while others see that the increase in production may not necessarily push the United States to export its surplus production as crude oil, as much as it will use it to promote its own industries by reducing the cost of electric power.

The technological advances in the production of shale oil in recent years led to a decline in the cost of its production to less than 50 dollars per barrel, down from 80 dollars. US Energy Information Administration predict that, with the continuation of a decline in the cost of shale oil production with ongoing technical development will come to equal conventional oil production levels. The US Energy Information Administration, according to statements issued in 2013, estimates that the world has about 345 billion barrels of technically extractable shale oil concentrated in 10 countries, along with more than 7 thousand trillion cubic feet of shale gas.

Argentina, China, Russia, Australia, and Mexico are among the richest countries, in terms of the availability of these reserves. They seek to emulate the hydraulic fracturing technique, employed by US companies, in order to take advantage of this type of oil at the commercial level. A a time when many countries began to explore the potential availability of this type of oil and its extraction, the impact of falling oil prices continues to reflect negatively on the feasibility of its production.

Views of International Groups regarding Feasibility of Shale Oil and Gas Production

Europe

Reports indicate that shale oil production is not within France’s plans in the coming years. As for the UK, it provides many facilities to companies operating in the production of shale oil and gas. It recently decided to reduce taxes on shale gas production by a large margin (62% to 30%), being the lowest tax rates on gas production in the world, despite protests by environmental activists and warnings on harmful gas emissions resulting from its production. As regards the United States of America, shale gas production progressed at a rapid pace and it has turned into a gas exporter thanks
to the rapid evolution of the production process in the past few years. In Germany and Japan, hesitation and environmental concerns remain a concern for decision-makers.

**OPEC Situation**

The Organization of Petroleum Exporting Countries (OPEC) decided to face the reality and check the potential impact of shale oil. It established a commission to study the effects of shale oil on energy markets and find out the size of this resource and its viability and cost. From OPEC’s point of view, the shale oil boom in the United States has already redrawn the map of oil trade. Nigeria and Algeria have already felt the impact of the US oil boom with the decline of stocks in their most profitable market and the redirection of some of their exports to Asia.

**Arab Gulf States**

Although the Arab Gulf states might not have to produce shale oil and gas, thanks to their reserves, stockpiles of conventional energy in addition to their high cost, Saudi Arabia recently took the initiative to begin the production of shale oil. It plans to soon begin exploration operations for shale oil with Aramco, which has submitted a tender for exploration to be carried out in 3 areas identified by KSA, including the Empty Quarter. It is certain that any new discoveries in this field will form an additional strategic stockpile for the Kingdom of Saudi Arabia.

**Asia**

Asia will not be able to switch to the use of shale gas or renewable energy in the next twenty years. It will continue to depend on traditional energy resources in its growth. China owns a share of the reserve greater than most other nations, with a regulatory framework that supports the development of shale gas extraction techniques. Nevertheless, technical problems, such as the scarcity of water, depth of gas reservoirs, proximity to rural areas, and lack of technical skills make extraction very expensive and easily prevent any development in the sector.

**Developing Countries**

Regarding other developing countries, including non-oil producing Arab countries, despite the availability of shale oil and gas in their territories and the rise in energy demand, most of them do not have sufficient material resources for investment in this field, which means that the production of shale oil and gas will be limited - for the time being at least - to rich countries that have financing capabilities, including some emerging countries, such as China, India, Brazil and South Korea, in which environmentalists do not represent a force or exert any pressure, as is the case in Europe and the United States. This will facilitate the expansion of the production process in the future.
Countries Producing Shale Oil and Challenges They Face

International reports - including a report published by the French Institute of Unconventional Hydrocarbon in mid-October-2015, stress that shale oil reserves are promising in three key countries: United States, Argentina and China. Although projections indicate that these oil reserves are distributed across five continents, it has been said that global reserve is still closer to speculation than to reality; because the number of fields producing shale oil outside of North America are still very limited.

Approximately 120000 wells of shale oil were drilled in North America - of which, 83% were drilled in the United States, compared with 0.83% of wells drilled in the rest of the world.

The development of the shale oil industry in the United States - despite its newness - left a clear impact on international oil markets. Without it, the price of a barrel of crude oil would not have fallen below 100 dollars. The report of the French Institute also indicates that US production of shale oil currently stands as 4.2 million barrels per day, and it also produces 1.8 million barrels per day of natural gas liquids and 350 billion cubic meters of gas. However, according to the same report, shale oil production in the United States began to decline as from the spring of 2015. This is expected to continue in the next few months due to a decline in the number of wells dug because of the deterioration of oil prices in the global market. The report adds that the shale oil produced by the United States currently meets about 60 percent of US oil consumption.

It is worth mentioning that shale oil is present in large quantities in the United States, Argentina, China, Russia, Australia, Mexico, and northern Europe, as well as Libya, Algeria and South Africa. Vide the map above.

The US shale oil industry is facing several challenges, including:

1. Potential of maintaining production level in spite of deteriorating prices.
2. Ensuring reduction of prices of engineering services and equipment.
3. Development of the liquefied shale gas industry.
4. Possibilities of reaching internal agreements that allow for exportation of shale oil to world markets.
5. Development of transport methods and infrastructure, corresponding to production and export operations.
6. Improvement of technology for producing shale oil to reduce costs of production and conserve the environment.

The second largest country producing shale oil in the world after the United States is Argentina, where 300 wells have been drilled thus far. Its production of shale oil is currently about 50,000 barrels per day with about 1.5 billion cubic meters a year of shale gas. The shale oil industry in Argentina encounters several challenges, including:

1. Persuasion of citizens to accept shale oil production.
2. Reduction of government subsidies for fuel.
3. Changes to tax laws and regulations required to attract foreign and local investors to invest in the industry.

The third largest country to produce shale oil in the world after the United States and Argentina is China. The French report considers China to be a promising country in the field of production of unconventional hydrocarbon, especially shale gas. The production of shale gas began in Sichuan province at a rate of 5 billion cubic meters per year. And the Government of China has ambitious future goals, seeking to produce 30 billion cubic meters annually by 2020. The Chinese shale oil industry is facing a number of challenges including:

1. Change of laws and regulations are required to help encourage investment in exploration and production, for example as laws on pricing and privileges for the use of gas pipeline networks, assisting in the development of industries and contributing to the country's independence in the field of energy.
2. Geological complexities of the country.
3. Difficulty of drilling in some Chinese basins.
4. Limited potentials in the field of water needed in the extraction of shale oil operations.
5. Lack of infrastructure necessary for the shale oil industry.

**GCC Strategy regarding Shale Oil**

Arab Gulf countries possess vast reserves of oil, especially KSA, which can remove any alternative or competitive substance by flooding the market with this strategic commodity. These countries - particularly Saudi Arabia - play a prominent role through price setting and the increase or decrease of production to maintain their strategic interests and position, because oil is their main source of income. The Financial Stability Report for 2015, issued by the Saudi Arabian Monetary Agency, predicted that low oil prices of crude oil in the current period will affect future production of oil instead of current production. However, that requires patience and tolerance on the part of OPEC countries to maintain the stability of production so that demand may meet the current
levels of supply. The report adds that the oil-producing countries outside OPEC - and shale oil states in particular - are indifferent to the policy of price cuts to rein in production, in that they are almost certainly optimistic that conventional oil will rise again and that the average international oil price will stabilize at a level of between USD50 -60 per barrel in the medium term. Some bodies expect to gradually narrow the gap between global supply and demand for oil, as they expect to get rid of excess supplies in the second half of 2016. Reports confirm that Saudi Arabia's policy and its oil Gulf partners caused a decline in oil prices, killing direct possibilities of a range of high cost oil projects, such as projects in the Russian Arctic, the Gulf of Mexico, the middle of the Atlantic Ocean and the Canadian tar sands. Wood Mackenzie Consultants point out that big oil and gas companies postponed 46 major oil projects of an investment value of USD 200 billion. However, the reality is that the cost of extracting shale oil in the United States is not high. It is mostly at medium cost. Experts from IHS, a US financial advisory company believe that shale oil companies may be able to reduce the extraction costs of this oil by 45% this year. This reduction is not only caused by the tactical shift to extract oil from higher yielding wells, as advanced techniques for drilling rigs allow for the launch of drilling operations in five or ten wells in different directions in the same location. Smart excavators equipped with computer chips are able to identify cracks in the rock, instead of drilling through thick layers of rock. New soluble clogs save about USD 300000 dollars in each oil well. All of these positive factors help reduce the costs of shale oil production. Since mid-2014 events have shown that most decisions made by KSA were for the purpose of protecting producers, and this has been realized by most countries - including Iran and Russia. It is one of the major countries using modern technology in a race against time to cut prices in order to make shale oil production of economic feasibility, on the one hand. As for the other important aspect, it is related to the economics of traditional oil-producing countries among which KSA is at the forefront. It poses the question whether the budgets of these countries can lower oil prices - and to what extent? As is well known, the Arab Gulf states have sovereign funds and big savings; however, the world's economies are vulnerable to price fluctuations. And by a simple comparison between what Norway did with its savings of oil and what happened in some of these countries, we realize the cause behind the grave situation faced by countries in the region as well as other Arab countries. Within the past five decades, huge developments have taken place in the non-oil countries, some of which were in the least developed countries, such as South Korea, China, Malaysia and Singapore. These countries did not have financial means and relied on foreign investment for their development. While Gulf oil countries brought in big money at certain times, they remained almost at a standstill, due to their heavy reliance on oil in the management of their economic affairs - except during more recent periods.
Based on the above, it becomes clear that investment in shale oil and gas is an irreversible US strategic decision, no matter how much will the price of oil may fall. It is determined to harness all its potential to rely on its own resources - or at least reduce its dependence on Arab oil. In addition, shale oil technology is in a state of rapid development. What would have been impossible a few months ago has become possible today. The US is preparing itself to make the cost of shale oil and gas production profitable ahead of any other sudden decline in oil prices.

**Conclusion**

Shale oil is a type of light oil, produced from rock containing kerogen deposits, which is a substance converted by heat into liquid hydrocarbon, as an alternative to crude oil. The production of shale oil was an important cause in the deterioration of traditional oil prices since mid-2014.

There are many lessons that can be drawn from this vital issue. However, the bottom line is that investment in the shale oil and gas industry is a strategic decision, taken by the United States, and the prospect of it being abandoned is only a figment of the imagination even if oil prices will fall. US recruited and mobilized its potentials to meet its oil needs. Therefore, shale oil technology was developed and progressed at an astonishing pace. What was unthinkable a few months ago has become a reality today - all this in order to make the cost of shale oil and gas production profitable ahead of any potential fall in prices. To this end, the OPEC States must work hard to excel in finding investment opportunities to reduce dependence on oil as a key or sole source to finance their investment budgets. The progress in the field of shale oil industry is a wakeup call for everyone to be prepared to provide new sources of income to finance their economies.

A decline in shale oil production, given the fall in world oil prices, is not expected, in the presence of huge financial potentials offered by major oil companies and global private equity firms - these will ensure the stability of the companies that produce this oil, as well as maintain shale oil as an element which competes with traditional oil in oil markets within the coming period.