

Report

The Shale Gas Revolution and its Impact on the GCC Economy

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Abstract

Since 2000, there have been signs of significant change in the field of global energy resources, with a relative change in the globally preferred sources energy. The World Energy Outlook 2011 special report published by the International Energy Agency (IEA) emphasised this transformation in the energy map by stating that the world was entering a 'golden age of gas'.

Such talk gained more weight with the onset of the shale gas revolution in the United States, particularly in the first decade of this millennium. This raised doubts about the stability of global gas markets. There is still ambiguity about the geopolitical impact of this 'golden age' especially since it is connected to market factors such as supply and demand, cost and price.

This report examines the key properties and technology of shale gas production, the factors of success of the shale gas revolution in its country of origin, the United States, and its projected impact on the global demand of energy. It also sheds light on the future impacts of the shale gas revolution on the economies of the GCC states, which rely primarily on the export of energy resources for their revenues.

Introduction

Since 2000, there have been signs of significant change in the field of global energy resources, with a relative change in the globally preferred sources energy. The World Energy Outlook 2011 special report published by the International Energy Agency (IEA)

emphasised this transformation in the energy map by stating that the world was entering a 'golden age of gas'. (1)

In another report published in the middle of the last decade, the IEA projected that natural gas will replace coal by 2020 and become the second largest source of primary energy in the world after oil. The IEA based its prediction on several objective considerations, foremost among which was the steady increase in demand for gas since the early 2000s, particularly by the emerging Asian economies China and India.

Talk about a 'golden age of gas' gained more weight with the onset of the shale gas revolution in the United States, particularly in the first decade of this millennium. This raised doubts about the stability of global gas markets. There is still ambiguity about the geopolitical impact of this 'golden age' especially since it is connected to market factors such as supply and demand, cost and price.

In the aftermath of this shale gas revolution, investors are quite doubtful and confused about their investments in gas production. Should they invest in this industry? Should they invest in constructing new pipelines or building stations and warehouses to store liquefied natural gas (LNG), and in building giant tankers to deliver it throughout the world? Do they invest in long-term supply contracts? These doubts may lead to dwindling future investment in the gas industry.

There are several scenarios for the future of this imminent 'golden age'. If shale gas development continues its boom in the United States, and is successfully copied elsewhere, energy consumers can expect a prosperous future where cheap gas dominates. On the other hand, if it declines in the United States and proves to be an exaggerated propaganda exercise which cannot be copied elsewhere in the world, a huge decline in gas supplies is expected to occur in the mid-term.

In light of this, this report examines the main properties and technology of shale gas production, and the factors of success of the shale gas revolution in its country of origin, the US, and its expected impact on the global demand for energy. It also sheds light on the future impacts of the shale gas revolution on the economies of the GCC states, which primarily rely on the export of energy resources to attract revenues to their state budgets.

Properties and technology of shale gas production

Shale gas is a natural gas generated by heat and pressure inside rocks that contain oil. Experts classify it as unconventional gas because it needs further processing before it

starts flowing. Just as in the case of 'conventional' natural gas, it is either dry or rich with liquids, such as ethane, which is preferred by the petrochemical industry.

Liberating shale gas requires the process of large-scale horizontal drilling and hydraulic fracturing using water and sand. The main purpose is to connect the surface with the source of gas to increase porosity. This highly developed technology is currently available in the US, and on a smaller scale in other countries, in Europe.

It is worth considering that this technology requires the injection of huge amounts of chemically-treated water. Therefore, the resulting water that gets pushed to the surface has to be disposed of. This raises the concern that it is possible that the chemical substances used in extracting shale gas would contaminate the sources of ground water; which represents a major hurdle to the future development of this industry.

There was a great decline in the production rates of shale gas during the first years of its production. The highest rate of decline occurred after the first year of production, and reached up to sixty per cent of the highest production level. Then the decline reached its lowest level after seven to nine years from the beginning of production.

Such natural and productivity characteristics of shale gas raise the cost of its production, leading to a reduction in the profitability of the discovered wells.

Shale gas revolution and the factors of its success in the US

According to a recent study done by the US Energy Information Administration and covering over forty-one countries around the world, it appears that the largest shale gas reserves are found in China with 1,100 trillion cubic meters (tcm), followed by Argentina with 802 tcm, Algeria with 707 tcm, the US with 665 tcm, and finally Canada with 573 tcm.

Such reserves have supported its production in relatively large quantities in the US during the past few years. From the 'the golden age of gas' to the 'shale gas revolution', one should ask: to what extent would it be possible to replicate the US shale gas revolution and start extracting the natural reserve of this product in other places of the world?

There is no easy answer to this question as the unique circumstances that allowed the shale gas boom to happen in the US, a country that owns an organised framework supporting the development of shale gas production technology, do not always exist in

other countries. This could impede the replication of the US boom elsewhere in the world.

The success of the shale gas development in the US is primarily attributed to a number of factors that might not exist in other countries. The most notable are the geological factors, tax exemption, and the availability of efficient industry service.

Therefore, there remain strong doubts about the possibility of cloning such favourable conditions outside the US, especially in western European countries which do not enjoy the privilege of tax exemption. Moreover, the service industry related to horizontal drilling and hydraulic fracturing are not as advanced as in the US. The geological conditions in these countries pose additional challenges.

Another obstacle is related to people's opposition to the exploration of shale gas in European countries because of two main reasons: environmental damage, and the fact that governments are the sole reapers of the benefits of investment in shale gas, and not the landowners as in the US. Additionally, there are regulatory laws and pressures exerted by non-governmental institutions especially in the European continent to prevent the initiation of shale gas extraction because of its harmful impacts on the environment – such as pollution.

Unlike in the United States, the relevant technologies (such as horizontal drilling and hydraulic fracturing) are subject to intensive inspection by local research institutions in Europe to reduce their negative effect on the environment. Efforts are being exerted to delay drilling until it is clear what the negative environmental impact of using such technologies might be.

Other areas outside the US, including Europe, also suffer from a scarcity of water needed for the process of drilling. Moreover, they face problems regarding the depth of the available water, the lack of required technical skills, and the difficulty of geographically locating wells.

Investing in natural gas, whether conventional or shale gas requires long-term contracts in order to be feasible. Any investment project in natural gas requires a guarantee for supplies in order to ensure full capacity operation. Therefore, long-term contracts are the best option to achieve this.

All these factors together consequently lead to an increase in the cost of exploration for 'unconventional' shale gas compared to those required for the extraction of 'conventional' natural gas.

A number of factors together have given strong impetus to the development of the 'unconventional' shale gas resources in the US, primarily stemming from:

- Geological expertise: in many cases unconventional gas reservoirs are positioned above the conventional positions largely explored in the past. This helps to identify drilling locations. For more than a century and a half, the US has gained considerable experience in drilling to extract primary energy resources such as oil and natural gas. This gives it a head start when searching for rocks that contain gas.
- The 1980 Crude Oil Windfall Profit Tax Act offered an alternate tax reduction on the production of unconventional fuel. It was about US\$3 per BTU of the oil barrel, which is equal to 53 cents for each 1000 cubic feet. (2)
- The developed technologies of horizontal drilling and hydraulic fracturing owned by specialised companies in the US.
- The liberation of unconventional gas extraction of binding and restrictive legislations at the federal level as well as at the state level. This is due to the fact that the technologies used in extracting shale gas are different from those used in conventional processes which are not part of current legislation. Yet, the concern of potential contamination of groundwater remains as a result of the chemical substances used in the process of hydraulic fracturing. The possibility of drafting stricter environmental legislation in the US may greatly obstruct the use of the hydraulic fracturing technology. Given the power of grassroots movements against environmental damage, the issue of potential contamination for ground water started to be subject to examination since issues related to groundwater are considered very sensitive in the US. Abundant research is underway to reform potential damage.
- The nature of subsoil ownership rights in the US, where the subsoil hydrocarbons belong to the landowner, unlike west European countries and other countries which consider it state property.
- Providing dynamic and competitive industry services that are capable of meeting the requirements of shale oil investors. (3)

The fact that these conditions do not all exist in other countries has hindered the replication of the US shale gas revolution.

Implications of the shale gas revolution on global energy demand

Due to investor concerns, investment in future gas supplies will be less than required if the shale gas revolution does not succeed in the US, or if it does not make much progress.

If the US shale gas revolution continues to prosper and is replicated elsewhere, the reduction in investment will not have a significant impact. Consumers will be able to look to a prosperous future with huge amounts of cheap natural gas since unconventional natural gas would fill the shortage.

On the other hand, if the shale gas revolution fails to meet expectations, natural gas reservoirs will face significant restrictions. Markets will solve this dilemma through supply and demand, with price increases to revive investment in the production of conventional gas. Since most gas projects require long delivery periods, the period in which consumers face rising prices may increase.

Another problem related to investing in renewable energy to generate electricity may also be monitored. This reflects the agreement of the general direction of the global community towards converting the world into a low-carbon economy in order to control climate changes. This will certainly reinforce doubts towards future prices of carbon.

Concerns raised by the shale gas revolution have doubled investors' doubts, as it is possible to provide relatively clean raw material (natural gas) cheaply. Therefore, it would be difficult to find investors to pay vast amounts of money for exorbitantly-priced equipment in order to reduce carbon emission.

The high density of LNG and its low transportation cost by sea remain the main drivers of the global gas trade. Accordingly, competitiveness in terms of the cost of this liquefied gas, which is less than that of the piped gas, its ability to reach markets that were previously difficult to access, as well as its great flexibility in supporting the security of the supplies are all major factors in making it the fastest growing and most traded product model in the world (not just in Qatar).

The impact of shale gas on the GCC economies

According to a report released in June 2013 by the Institute for Asia Investment, it is possible for a growth in the supply of natural gas in international markets to lead to a

decline in the prices of traditional energy sources, gas and oil, but it will not have a significant negative impact on world markets. (4)

Given the advanced technologies used in extracting conventional natural gas, its low cost, and the possibility to limit negative environmental impact, it is expected that the growth in conventional gas consumption during the next two decades will exceed the growth of oil consumption.

Without doubt, the new supplies of gas resulting from the extraction of shale gas will have a negative impact on the leading exporters of conventional natural gas in the region, such as Qatar and Iran, and will lead to increased pressure to lower oil prices. However, it is unlikely that the main role of conventional energy will be affected within the global economy during the next two decades by the vast growth of demand from the developing economies, especially in Asia (particularly in China). Asian countries would not be able to easily shift to unconventional energy sources such as shale gas, or renewable energy (wind, sea waves, and solar energy). However, their growth will remain dependent on conventional energy sources. This is due to technical reasons related to the processing platforms present in these countries, as well as other reasons related to the type and components of the raw material for the conventional energy of oil or gas, whose characteristics are different from their unconventional counterpart.

In relation to the economies of the Gulf States, Asia is their largest trading partner, and is expected to remain the primary source of growth in global demand for conventional energy resources in the coming decades. Such resources are considered to be the backbone of the GCC economies and the main source of their national income.

According to a 2013 third quarter report published by the Asia Investment Institute, Asian countries with emerging economies currently import forty-three per cent of the total energy exported from the Gulf states, up from a mere fifteen per cent in 1990.

Within the same context, with regard to the major economic blocs in the world (Japan, Europe, and US), indicators for 1990 show that they have imported about forty-five per cent of the total exports of the GCC. However, the shares of these blocs combined have dropped to twenty-three per cent only after more than two decades.

It is likely that this trend will continue, especially if the United States is able to take advantage of its reserves in a manner that can transform it from being the top oil importer in the world to an exporter by 2017, and to be self-sufficient in energy production by 2030.

In terms of the indirect effects of the shale gas revolution on the economies of the Gulf states, it is worth noting that the Gulf Petrochemical and Chemical Association has warned the manufacturing sector in the Middle East in general and the Gulf region in particular, against the consequences that may be taking place in the petrochemical sector particularly with regard to the future of the fertilizer sector. It is expected that the fertilizer sector in the GCC states will be negatively affected as a result of the increase of the production of shale gas in the United States. Shale gas provide US factories with the raw materials necessary for the preparation of fertilizers such as nitrogen and sulphur at low prices, which may cause the producing companies in the Gulf region to retreat.

Thus, Gulf companies and their Asian counterparts working in the field of exploring, refining, transporting and distributing energy products such as coal, oil, and liquefied gas, may benefit from this general trend by working on building outstanding partnerships between both parties.

Accordingly, the Gulf States are most likely to maintain their central role, as the leading energy-exporting region to the world.

Conclusion

Despite the fact that shale gas will most probably cause a revolution in the field of energy if it is replicated elsewhere outside the US, such expectations may be limited in relation to many factors, the most notable of which are:

- The high cost of extracting shale gas compared to the conventional natural gas.
- The general trend towards the establishment of a more stringent regulatory framework for the use of hydraulic fracturing in shale gas production which raises serious environmental concerns.
- Increased Asian demand for conventional energy products (oil and gas) because of the rapid economic growth in many countries in Asia.
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All such factors will impede, without a doubt, the process of transforming the current stable scene of the global energy map in the near term.

Assuming that the production of shale oil and gas will increase in some countries such as the USA and in Western Europe, Gulf states will still have an unrivalled advantage in this field because of the low production cost. The cost of production remains the main determinant for the economic feasibility of any product in the world. The estimated cost for producing oil in rocky locations in the USA ranges between US\$50 and US\$75 per barrel, while the cost of production of one barrel of oil in the Gulf area does not exceed

US\$15. (5) There are many reasons for this, most notably, the close proximity of the oil reserve to the surface.

In this respect, GCC exports of conventional energy products are expected to be mostly stable in the next two decades because of growing Asian demand. However, decline is likely to occur in the profit margin due to the decreasing need for external energy stemming from other consuming countries.

On the other hand, GCC states have been able to overcome the implications and effects of the political and economic turmoil that has swept through many Arab countries in what has become known as the 'Arab Spring Revolutions' over the past two years. This happened through a large increase in governmental spending with a budget that relies on the proceeds from exporting oil and gas being pumped into infrastructure projects, social grants and aids.

It will be useful for the Gulf's leading companies in the field of oil, gas and their derivatives to think carefully and to seriously examine the possibility of investing in shale oil and gas production in the USA and other parts of the world. Such companies also have the unique advantage of their extensive experience over the past decades which has been significantly developed to the extent that Gulf companies operating in the field of energy are classified among the international leading companies in that field.

The shale gas revolution will have numerous implications, which have already started to take effect in the global gas market, where the demand has increased for natural gas, leading to a decline in its price. However, a number of issues related to the future remain uncertain, such as the quantities that can be produced and the positive or negative impact on the price in international markets.

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