Author: Justin Dargin,
Energy and Environment Scholar,
University of Oxford

The Shale Gas Revolution: the implications for MENA and the UAE

Shale gas production has increased exponentially over the past decade. Due to technological advancements pioneered in the US, shale gas production has turned the US from being a predominantly energy importing country to one that is expected to export significant amounts of energy over the coming decade. Shale gas development has increased the competitiveness of the American petrochemical and manufacturing sectors and threatens the traditional feedstock price advantage of Middle East and North Africa (MENA) energy producers. As a result of this turnaround, the economic and geopolitical impact on the traditional energy exporting countries of the MENA region is expected to be immense and will undoubtedly challenge the global energy status-quo.

The export of American LNG will place economic pressure on MENA gas exporting countries

WHAT NEXT

Shale gas production in the US and Canada is expected to continue to grow. Today, it comprises nearly a third of US gas production. If current growth rates continue, by 2030 it could provide nearly half of US gas production. The US is geared to begin export of shale gas through liquefied natural gas (LNG) export terminals by 2015. The potential export of large amounts of US LNG would place economic pressure on MENA gas exporting countries, such as Algeria, Egypt, Libya, Oman, Qatar and the UAE, that have often invested billions of dollars in LNG export infrastructure with the expectation of continued demand growth from both developed and developing countries. Additionally, the spread of shale gas production technology globally will increase production in other jurisdictions leading to a significant expansion of global gas production by the beginning of the 2020s.

At the same time, in the long term, the global effort to transition away from more carbon intensive hydrocarbons will increase gas demand rates across the world. Also, due to the Fukushima nuclear crisis, nuclear energy is much less attractive as an alternative fuel source than previously. These factors add to the attractiveness of shale gas and should blunt some of the health and environmental concerns of hydraulic fracturing.

Yet, shale gas production and technology also offers significant opportunities for MENA countries, many of whom are facing their own natural gas shortages, as it is likely that there are substantial shale and other unconventional gas reserves in the region in the region.

ANALYSIS

Shale gas exploitation in North America and other countries will have a dual effect on MENA energy exporting countries. On one hand, the spread of shale gas technology will encourage MENA countries to exploit their own shale and other non-associated natural gas reserves. This will have a beneficial impact on their energy security and allow them to replace more expensive fuel sources (such as oil or imported LNG) with domestically produced natural gas. Additionally, the MENA countries that are experiencing natural gas shortages will have an improved energy mix with the development of shale and other non-associated gas reserves.

On the other, shale gas production has the ability to undermine the industrial strategy of most energy exporting MENA countries, particularly for the Gulf countries and Iran. Global petrochemical companies are relocating to the US to take advantage of low-cost US shale gas, thereby enabling them to export their products at much more competitive prices vis-à-vis their MENA competitors. For instance, at

the end of 2012, American propane costs were approximately $400 per ton, while MENA costs averaged approximately $600 per ton. The decline in American petrochemical production costs has been stark. Furthermore, in 2012, it cost less to produce ethylene in the US than in the Middle East as US prices now are 70% lower than they were ten years ago.

Expected US LNG exports would also depress global LNG prices. This would be detrimental to MENA countries that depend upon LNG export, but for MENA countries that are facing significant natural gas shortages, lower LNG prices could assist them in meeting production shortfalls without a large cost burden.

Continuing advancements in hydraulic fracturing are lowering the cost structure of North American shale gas production. The development and spread of more advanced hydraulic fracturing technology will have both positive and negative ramifications in the MENA region. The wave of investment in Asian shale gas and coal bed methane is perhaps more worrying to MENA countries than US shale and petrochemical investment as Asian countries would want to build up their own domestic petrochemical production. Gulf petrochemical producers do not have a large internal market and so depend on export to the Asian/Pacific market. Also, there is potential that not only would the MENA petrochemical producers lose a large market, but also face severe export competition in the mid-to long-term from this region as American shale gas technology is deployed across the Asian/Pacific region.

Moreover, the enabling factors that drove North American shale gas production, such as a flexible investment code, easy access to capital, market pricing, sufficient amounts of water and an expansive gas transportation grid, are lacking in most MENA energy producing countries, raising doubts as to whether shale gas could be produced in commercially viable quantities in the MENA region.

Implications

The resurgence of the American petrochemical sector significantly threatens MENA's downstream natural gas sector diversification. For example, the US and Canada could add approximately 77 million tons of LNG capacity by 2020. By the end of the decade, the surge in North American and Australian gas output could depress global LNG prices by 30-40%. However, in the mid-term, the shale gas production cost in North America will likely increase due to more regulatory oversight from the national and subnational level.

Meanwhile, most MENA petrochemical producers are facing a steep increase in feedstock costs due to production and allocation challenges, while at the same time, North American petrochemical producers are becoming much more price competitive. In addition, Arab Spring associated socio-political instability associated with the Arab Spring means that security concerns and costs will increase -- especially in North Africa -- as MENA countries attempt to attract IOC investment.

Challenges and opportunities for the UAE

The UAE has both challenges and opportunities afforded by North American and potential future global shale gas production. While the UAE shares the same concerns as other MENA natural gas producers about a long-term decrease in the price competitiveness of its LNG sales and petrochemical exports, it does have the potential to benefit from the application of American hydraulic fracturing technology.

The UAE can benefit from advancements in shale gas technology by deployment in some of its most difficult gas fields

While comprehensive shale gas seismic surveys have not yet been undertaken in the UAE, the UAE is not expected currently to have significant shale gas reserves. However, it can benefit from advancements in shale gas technology by deployment in some of its most difficult gas fields. For example, in November 2012, Adnoc completed its first well-tests to determine whether shale gas drilling technology could unlock currently inaccessible gas fields in the UAE. Conventional drilling has hitherto failed to produce large volumes of low-sulfur gas from the tight carbonate formations. Initial tests were positive utilising multi-stage acidic fracturing to stimulate viable gas flows from the limestone and dolomite formations.

Consequences for growth in the UAE

As the second largest Arab economy, the UAE is currently experiencing gas shortages. As a result, the UAE could potentially benefit from the sharp rise in shale gas production by obtaining lower priced gas imports.

For instance, at the end of 2011, the UAE produced 51.7 billion cubic meters (BCM) of marketable natural gas (excluding gas used for reinjection). It also consumed 62.9 BCM at the end of 2011. Therefore, the shortfall of 11.2 BCM caused the UAE to import LNG at international market rates to make up the difference. If the UAE does not create a comprehensive strategy to reduce its natural gas consumption, increase production of non-associated gas and develop a comprehensive gas import strategy, then its economic competitiveness for the mid-to long-term could be harmed.

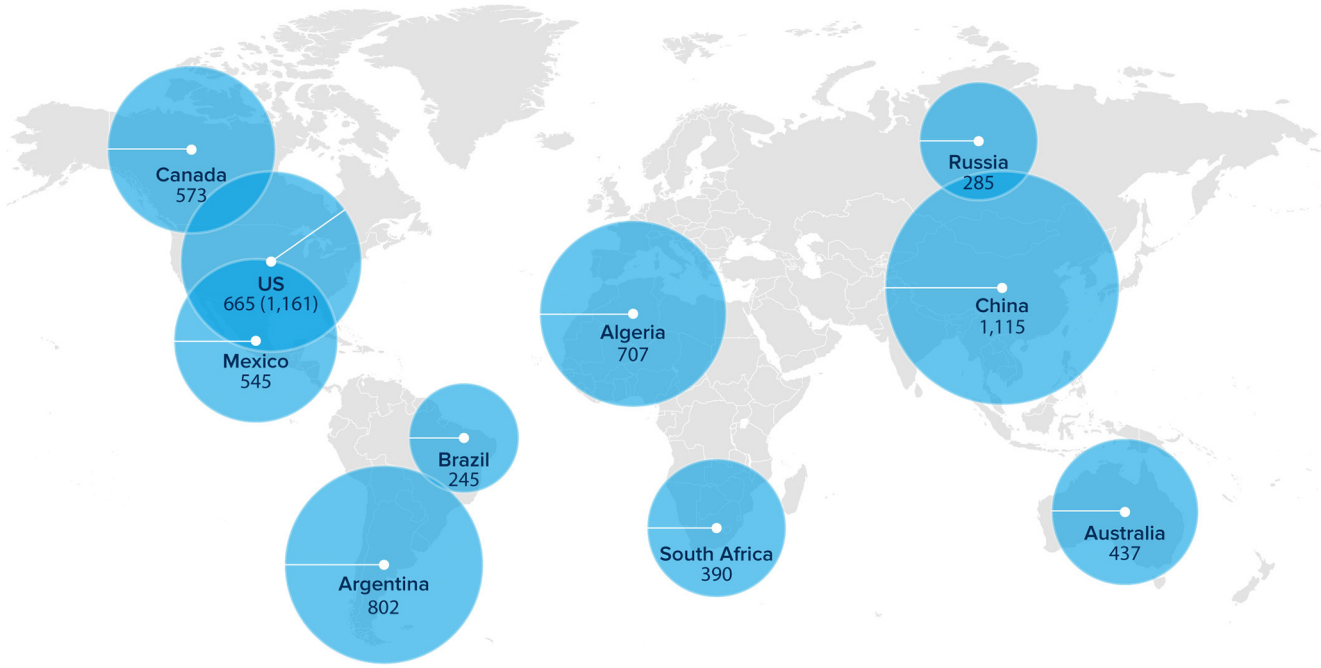

Figure 3: Top 10 countries with technically recoverable shale gas resources

EIA estimated shale gas resources in 2013 (tcm) ARI estimates in parentheses

Source: EIA

Table 3: Technically recoverable shale oil and shale gas reserves in the context of total world resources

	Crude oil (billion barrels)	wet natural gas (trillion cubic feet)
Outside the United States		
Shale oil and shale gas[1]	287	6,634
Non-shale[2]	2,847	13,817
Total	**3,134**	**20,451**
Increase in total resources due to inclusion of shale oil and shale gas	**10%**	**48%**
Shale as a percent of total	**9%**	**32%**
United States[3]		
Shale / tight oil and shale gas	58	665
Non-shale	164	1,776
Total	**223**	**2,431**
Increase in total resources due to inclusion of shale oil and shale gas	**35%**	**38%**
Shale as a percent of total	**26%**	**27%**
Total world		
Shale / tight oil and shale gas	345	7299
Non-shale	3,012	15,583
Total	**3,357**	**22,882**
Increase in total resources due to inclusion of shale oil and shale gas	**11%**	**47%**
Shale as a percent of total	**10%**	**32%**

1: Advanced Resources International, Inc. (ARI) 2013

2: Oil & Gas Journal, Worldwide Report, December 3, 2013; US Geological Survey, An Estimate of Undiscovered Conventional Oil and Gas Resources of the World, 2012, Fact Sheet 2012-3028 and March 2012; US Geological Survey, Assessment of Potential Additions to Conventional Oil and Gas Resources of the World (Outside the United States) from Reserve Growth, 2012, Fact Sheet 2012-3052, April 2012

3: US Energy Information Administration, various reports

Given that the UAE seeks to increase its oil production to 3.5 million barrels per day (m/bpd) by 2018, a significant increase from a 2.65 m/bpd average in 2012, gas consumption utilised for re-injection is poised for a major expansion. Furthermore, the International Energy Agency (IEA) predicts that MENA gas supply will grow relatively weakly until 2035, at about 2.4% per annum. The estimation of the Emirati gas supply growth is at approximately 0.8% per annum, trailing both the global and regional average.

Even under the most optimistic scenario that the various domestic non-associated gas fields in which the Emirati government is heavily investing come online as planned, when compared against gas consumption growth rates of approximately 5-6% per annum, there would potentially be a 29.4 BCM/yr shortfall by 2020. Under this scenario, growth in gas supply globally, led by shale gas production, would benefit the UAE by allowing it to obtain lower LNG prices. This would benefit the UAE industrial diversification strategy, which is principally focused on expansion of the downstream gas sector by the provision of low-priced natural gas inputs.

On the other hand, growth in shale gas production, much of it presumably to be sold by LNG in the mid-to long-term, could also be detrimental to the UAE as a global LNG supplier. Therefore, a decline in global LNG prices would reduce Emirati LNG-based governmental revenue. But, as Emirati LNG contracts mostly expire between 2018-2020, it seems as if the UAE will redirect most of that gas to the internal market and cease to be a global LNG supplier. Therefore, the threat to Emirati LNG sales is not a significant problem, and the benefit of obtaining lower-priced LNG would outweigh a decline in governmental revenue. In addition, most of the Emirati LNG sales are based on long-term contracts which leave little flexibility for incorporation of spot prices.

What does this mean for economic diversification?

The principal threat to the Emirati economy is that of downstream gas sector expansion in other regions of the world due to shale gas production. The UAE industrial sector currently comprises approximately 16-20% of national GDP, with annual increases. The three main pillars of the UAE industrial sector are petrochemicals, and energy-intensive steel and aluminum production. While these industries are essential to Emirati diversification, the reason why the UAE was the premier destination for downstream expansion by global petrochemical, steel and aluminum companies was due to the low-priced natural gas inputs and power (predominantly produced by natural gas) supplied by the government.

For international downstream companies, the logic of continuing producing or manufacturing in the UAE would seemingly lose coherence if natural gas and power prices are lower in other jurisdictions because of prodigious amounts of shale gas. Moreover, as the UAE exports the majority of its industrial production, It runs the risk of having increased competition from other countries (such as the US) and of losing markets when former importing regions (such as China) begin to produce petrochemicals domestically.

Furthermore, as the UAE exports the majority of its industrial production, It runs the risk of having increased competition from other countries

A potential harbinger of this particular scenario is what is currently occurring in the industrial competition between the US and the EU for manufacturing supremacy. The EU fears that an “energy gap” has developed between the two jurisdictions thereby granting American manufacturing a significant advantage over its European competitors. Due to a significant production cost advantage in the US, European manufacturers are currently paying 3-4 times the amount that American companies pay for energy and power. As a case in point, Voestalpine, the Austrian steel company announced in March 2013 that it would construct a $730 million direct reduction plant in Texas to produce a product known as ‘sponge iron’. The reason Voestalpine chose Texas was due to its proximity to shale gas reserves, and consequently, low power tariffs. But, when taken in context, Voestalpine merely represents a trend that is becoming stronger day by day where industrial investment is slowly but surely heading to the US market.

Therefore, while there are stark differences between the Emirati, and, indeed, the entire MENA industrial sector and European industry, the dynamics of what could be termed ‘gas competitiveness’ are quite consequential and will influence the UAE’s ability to successfully diversify its economy in the long-term.