The Geostrategic Implications of the Shale Gas Revolution

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1.0. Introduction

This paper attempts to look at the geostrategic implications of the shale gas revolution. It argues that the implications are very significant. At the very least the shale revolution strengthens the United States; reduces China's energy dependence; generates a major global stimulus which takes the Western economies off the fiscal rocks, while potentially destabilizing both the Russian Federation and Saudi Arabia.

Part two of this paper tries to give some account of the true scale of the shale gas revolution, part three looks at the geostrategic implications for the United States, part four looks at the implications for Europe, part five considers the position of China, the Russian Federation and China in the light of the shale revolution and part six offers a conclusion.

Overall the point is made here is that the shale gas revolution is not principally about gas. When exploring for shale gas a significant amount of shale oil is also being discovered, which alone may make the US 'energy independent' in oil by 2020. An even more significant factor is the ability, with large volumes of cheap gas available globally to develop a natural gas transportation network in the US, Europe and China. Such an alternative fossil fuel transportation network will generate incentives to switch from oil to natural gas at scale for most commuter vehicles and fleet transportation. It is the prospect of shale oil and natural gas for transportation, it is contended here, that will have the greatest geostrategic effect.

2.0. The Scale of the Shale Gas Revolution

The technological developments that have allowed US energy companies to access oil and gas from shale rock is going to have immense implications for the global economy and geopolitics in the first half of the 21st Century. It is the most significant development in the energy industry since coal was replaced by oil as the principal fuel for transport in the 1920s.

Like coal shale gas is very widely dispersed across the planet and potentially cheap to exploit. The geopolitical implications are significant. Not least the 80:10 ratio which has held for decades-that 80% of all fossil fuels are in OEPC countries and Russia and only 10% in OECD countries and China is in the process of being imploded.

The United States through the work principally of George Mitchell in the Barnett Shale in Texas took two existing technologies, horizontal drilling and hydraulic fracturing and through a process of experimentation worked out how to deploy those technologies to access gas and oil cheaply from shale rock.

The impact on US gas production has been stunning. US production of shale gas has leapt from 1% of natural gas production in 2001 to over 35% in 2011. The US Department of Energy, Energy Information Agency (EIA) estimates that the US has 25 trillion cubic metres (tcm) of technically recoverable resources of shale gas, combined with conventional resources enough to last the United States for 200 years[1].

Nor is this 'revolution' likely to be confined to the United States, the EIA estimates that China has even greater recoverable resources (estimated by the EIA at 36tcm). Substantial shale gas resources are believed to exist in Argentina,

[1] EIA, *World Shale Gas Resources* (Washington DC, 2011) 3.

Mexico, Russia, Ukraine, Australia[2]. In all those states developed is now ongoing underpinned by assistance in all but Australia from the United States.

The United States has so much gas available that prices have collapsed to approximately $3MMBTU (the European equivalent is $8-10 MMBTU, and in Asia $13-16 MMBTU). This has led to a major upswing in gas use, undermining the coal market which has seen coal for power generation fall to around 30% of all power generation from a height of 50% as recently as 2005. Low gas prices are also rebuilding the American industrial base as chemical and other energy intensive industries are 'onshored back to the United States[3].

It is not only shale gas that is being found. There are also significant amounts of shale oil and hydrocarbon liquids being recovered. A recent paper from the Belfer Centre at Harvard University suggests that by 2020 the US could be recovering as much as 6.7 million b/d of shale oil and hydrocarbon liquids[4]. The US only imported 11mbd in 2011[5]. According to the EIA there is the prospect of shale oil availability in many other states including China, France and Argentina.

In addition, as discussed below there is the prospect of using the increasingly large volumes of gas available for natural gas transportation.

3.0. Implications for the United States

The geostrategic implications for the United States of the shale gas revolution are almost wholly positive. The United States is for the forseeable future self

[2] *WSR, ibid,* 38.5tcm of technically recoverable resources.
[3] Low energy prices appear to assist a broader onshoring of manufacturing into the United States. See Fishman, *The Insourcing Boom, The Atlantic,* December 2012.
[4] Maugeri, *Oil, The Next Revolution* (Harvard, 2012). There are compelling reasons to suspect that the figures for US shale oil production may well be very conservative. One major factor in such an assessment is that the low prices of gas in the United States is causing a major shift from pure play shale gas wells to shale oil and liquid hydrocarbon wells.
[5] EIA, Oil Import Figures in 2011.
http://www.eia.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbblpd_a.htm

sufficient in gas, and is likely to be able to draw on hemispheric or North American self-sufficiency in oil by 2020.

The most significant factor is not self-sufficiency of itself. At least in respect of oil the US will remain part of the global oil market and affected by global price movements[6]. What is significant is the extra supply that the United States brings on to the market. Through the US no longer needing to import most of the 11mbd it currently imports; through exports and through exporting modern shale gas technology to assist other the US is increasing fossil fuel supplies and thereby reduces fossil fuel prices on global markets.

This is likely to be reinforced by a switch to natural gas transportation. Already Washington has introduced a new tax regime to encourage a switch of fleet vehicles, buses and long haul trucks to natural gas. This will take out a significant part of US oil demand.

However, what is potentially more significant is the prospect of home refueling kits being developed and marketed to encourage US consumers to use the existing domestic natural gas system to fuel their cars. These kits are likely to enter the market at scale around 2017/2018. Given the significant gap between US natural gas prices and oil there is a very significant incentive for consumers to acquire these kits and either convert their cars to natural gas or buy a compressed natural gas powered car. Given the fact that the infrastructure and supply network already exists there are no significant capital costs save the 'last mile' to install a kit which allows the domestic natural gas supply to fill up a compressed natural gas vehicle.

[6] A global gas market is much more difficult to develop due to the 'point to point' nature of pipeline gas and the significant transport costs of liquid natural gas. Nevertheless a mixture of a much larger number of gasification and liquefaction plants driven in part by shale gas development and the falling costs of LNG processes and carriage may make it possible for a genuinely global gas market to be developed over the next two decades. It should also be noted that while there is not yet a global gas market with a single gas price, market developments on one part of the planet can have a significant effect on other parts of the planet. For example, as shale gas production in the United States got underway the market for LNG collapsed switching LNG into the European market causing a major fall in gas prices on British and Dutch hubs. One consequence was that Gazprom had to offer significant discounts to a number of its key EU customers.

Most of the United States and Europe would be able to use domestic gas supplies as domestic filling stations, as well as factories, offices, supermarkets and schools. In fact wherever there is a domestic natural gas supply refueling kits can be plugged into the network to provide further greater numbers of refueling stations at very low cost.

The US has also sought to encourage these developments worldwide with its memoranda of understanding on shale gas development with Ukraine, Poland and China. The new Energy Resources Bureau in the State Department is seeking to spread knowhow and understanding of the technologies and regulatory requirements while encouraging and supporting US companies to develop new markets and new opportunities worldwide.

In essence what the United States is in the process of creating is a structural increase in global supply of fossil transport fuels which will overwhelm the structural increase in demand caused by the economic development of China and India over the last decade. The principal impact of creating over the next decade a fundamental structural increase in supply will be to provide the US but also the whole global economy, a major economic stimulus, taking the US and other Western economies off the fiscal rocks.

The combined impact of native commercial innovation and creativity, open energy markets and effective political and economic statecraft by the United States pushes very hard against the received narrative of American decline. The US has already received a major economic stimulus from shale gas. It is now in the process of creating a much larger economic stimulus by the deployment of shale and gas transportation technology globally. In addition, the US is benefiting from a major multiplier effect from cheap gas resources as energy intensive industries are being onshored back to the United States. Currently the US industrial base is undergoing a renaissance as chemical and steel plants are reopened and expanded. US manufacturing industry is finding it can slaughter high energy priced European competitors and hold their own with the Chinese.

The shale gas revolution for the United States is almost wholly positive. There are however two negatives. The first is in respect of China. If China is able to develop its shale gas resources at scale and deploys gas transportation technology and infrastructure it could significantly reduce its dependence on Middle Eastern oil. This would have the effect of reducing American leverage over China, as China would no longer be dependent on the US Navy protecting the flow of oil through the Straits of Hormuz and the Indian and Pacific Oceans.

The second negative factor is that by generating a structural increase in supply the stability of Russia and Saudi Arabia are threatened. Both states had assumed that the structural increase in demand stemming from Chinese and Indian development would ensure long term stable high oil prices. Long term lower prices are likely to make it difficult to maintain budgets and keep social peace. Significant internal turmoil may well harm US interests (There is a further discussion on China, Saudi Arabia and Russia below).

4.0. Implications for the European Union

On one view the shale gas revolution in the United States increases European energy security. In 2010 it was clear that liquid natural gas shut out of the United States because of the shale gas glut headed to the European market creating significant market liquidity. This ended up being a temporary phenomena because of the draining of liquidity from the market due to the Fukushima disaster. However, the direction of travel toward greater liquidity is clear. While there is a tightening in the market it is also the case that a lot of LNG coming on stream; and that the 'shutout' effect on LNG experienced in the US may well occur elsewhere as shale gas production gets underway worldwide.

In addition, Eastern Seaboard LNG liquefaction facilities in particular, if they are permitted by the US Department of Energy, could play a role in supplying European consumers. Currently 19 LNG export licences have been filed by

companies wanting to export shale gas as LNG. The combined liquefaction capacity if it is all built amounts to at least 60bcm.

Potentially even Eastern Seaboard shale gas could be exported to Asia not Europe. This at first sight is all the more likely as in 2014 the enlarged Panama Canal will be available to take LNG carriers into the Pacific. However, the scale of LNG and offshore developments in Asia, from the Australian shale and conventional gas developments to the Alaskan and Canadian export of shale gas as LNG raise serious questions of whether Asian prices will provide sufficient arbitrage to make shipments worthwhile. In addition, there is the danger of liquefaction capacity outstripping gasification capacity in Asia. Hence, Europe is likely to find itself being able to draw on US shale gas as LNG.

Furthermore, the next phase of investment decisions is now under way which should ensure that post-2015 there will a further increase of LNG capacity worldwide. Some of this, as in the case of Australia, is shale gas converted to LNG. In any event it presages a further growth in non-US LNG liquefaction capacity.

Less happily from a climate change perspective, but positively from an energy security perspective the collapse in US gas prices has resulted in a surge of US coal being exported to Europe[7]. If as expected gas prices only rise marginally then this trend is likely to continue. As other states develop shale gas production it is likely that domestic coal production will be exported with one of the major destinations for coal being Europe. Europe would become the dumping ground for cheap coal, which while negative for C02 emissions does provide Europe with energy security advantages.

What should be of particular concern to the EU and the Member States is the impact of the shale revolution on the oil market. The US has also moved to encourage development of natural gas in transportation, this will reduce demand

[7] EIA, *Coal Production Quarterly*, 1Q 2012. The first quarter of 2012 alone saw a 49% increase in US coal exports to the European Union.

for oil over the medium term. More immediately is the prospect for significant supplies of oil from shale oil plays. The US is already recovering over 500,000 b/d from the Baaken field. The Belfer Centre suggests that by 2020 a series of US oil shale plays could be delivering 6.6 mbd by 2020[8]. Together with offshore and access to Canadian and Mexican resources, North America is likely to be 'energy independent' in oil within its hemisphere by the end of this decade.

The energy security consequences for the European Union are profound. The EU and its Member States will become increasingly dependent on the United States for supply security in respect of oil when the US itself is no longer dependent on middle eastern oil. Can the United States be expected to keep its military assets indefinitely, such as the Vth Fleet, in the Gulf as a social service to the European Union? Do the Member States with significant naval and military traditions such as the United Kingdom and France have to take a larger role in maintaining the security of the region and access of oil tankers to the Gulf and Suez?

One question for the European Union states as a consequence is do they follow the United States down both the shale gas and gas transportation path? If the EU states develop their shale gas resources on a significant scale and deploy gas transportation technology (most EU states have a domestic natural gas infrastructure network) the Union could significantly reduce oil demand making itself less dependent on US protection of Gulf oil flows.

However, the Union would still be vulnerable to instability from both the Middle East and Russia should the oil price fall and then stay at low price levels. The danger here for Europe is that while it gains from lower energy prices and it can potentially protect itself from greater supply instability, it will be directly affected by Middle Eastern and Russian instability caused by a structural fall in the oil price.

5.0. Implications for China Russia and Saudi Arabia.

[8] Maguri, *op cit.*

China: The implications for China are almost entirely positive as indicated above the Chinese have the prospect of exploiting 36tcm of recoverable shale gas. It is likely for a host of reasons that China will develop its shale gas resources. China currently relies principally on coal. This is a source not just of C02 emissions but also of a range of health damaging pollutants which directly affect the inhabitants of all major Chinese cities. Aside from the C02 and health effects there is the national security issues surrounding the use of oil, gas and increasingly coal which is imported across the Indian and Pacific Oceans where the US Navy maintains the ability to blockade the sea routes. For a rising power such as China, developing domestic shale gas to be able to significantly replace the majority of fossil fuel exports becomes a compelling political priority.

There are significant barriers to the objective of developing the shale gas industry at scale; the pipeline infrastructure and the domestic gas network. Nevertheless the security advantages are so compelling it is difficult to see how the Chinese government will not seek rapid development of shale gas and accompanying gas networks. In particular, as indicated above given the potential for natural gas transportation to limit dependence on oil the Chinese government is likely to seek to develop a major natural gas transportation infrastructure.

However, China has the same problem as the Europeans and the Americans in that a structural increase in supply is likely to bring instability to two of the principal oil suppliers, Saudi Arabia and Russia. While China is likely to be more concerned with the stability of Saudi Arabia as an oil supplier, it may well be concerned as to the stability of Russia given that Russia is its neighbor on its northern border.

Russia and Saudi Arabia: The difficulty for both these states is that the 'lifting price' (the price of getting the oil out of the ground) is no longer relevant. It use to be the case that for both of those states as long as there was a reasonably

healthy margin between the lifting price and the level of the global market oil price state budgets would be secure and stability assured.

However, due to the demands of more querulous and demanding populations and the consequent growth in state budgets to placate the population the lifting price is no longer so relevant. What is now far more relevant is the social price, ie the oil price which will cover the state budget at level which will maintain social peace and regime stability. This price for both states at least in the $70-$90 range and for Russia it may well be higher.

On balance it is likely that despite the 'Arab Spring' Saudi Arabia has greater capacity to withstand a structural increase in supply. It has a much smaller population to protect; proportionally and absolutely greater reserves to deploy and probably more regime coherence ie officials in both the state bureaucracy and Aramco with the capacity to take effective steps to rebalance the economy. For example, by developing gas resources at scale and building a major petrochemical industry as part of an alternative economic base.

Russia by contrast has a population of 140 million; proportionately far less reserves available to see it through a sustained oil price fall and a requires a higher oil price to balance the books. It is also doubtful that there is sufficient coherence and willingness amongst the regime elite to take the necessary steps to ensure regime survivability as in the Saudi case.

It is difficult to say when the markets will recognize the appearance of a structural increase in supply. The likelihood is that it will be before the full physical effects of that supply have been brought onto the market. The markets will re-price oil when they finally recognize that structural increase in supply is overwhelming the structural increase in demand. When it becomes clear a major price adjustment is taking place both regimes will come under significant internal and external challenge.

6.0. Conclusions

The geostrategic implications of the shale gas revolution have not been entirely appreciated globally because the focus of most interest in shale gas has been in its impact on global gas markets. What has not been appreciated is that the far greater effect falls upon the market for transportation fuels, and as consequence the geostrategic implications of shale gas are much more significant.

From a Western perspective the greatest challenge falls upon the European Union. The Union and the Member States have not really begun to grasp their growing strategic vulnerability. First, It is difficult to see how the United States can tolerate in the longer term a situation in which they protect the oil flows to the European Union, with little or no investment by the Union in its own energy security. The Union and its Member States will be required to engage in the Gulf or find itself becoming the customer of last resort.

The Union has also to face up to the problems of a world in which both to its south and east there is increased instability as oil revenues drop. There is little evidence so far that either Union or the states have begun to consider the problems that may flow to Europe as the result of the success of the US shale gas revolution.

For the United States the shale gas revolution brings new opportunities and choices. It reaffirms the leading role of the sole superpower and underpins the view that the US will remain the preponderant power well into the 21st century.

China also gains from the shale gas revolution by reducing its energy dependency on the Middle East and reduces it supply security dependency on the US Navy.

The greatest geostrategic threats however, fall upon the Saudi Arabia and the Russian Federation. As indicated above a relatively small population; substantial reserves and a willingness to take decisive action to protect the state may rescue the Saudi state. It is much more difficult to believe that the Russian Federation

can survive with its present leadership and political orientation should there be a structural increase in supply resulting in a prolonged fall in oil prices.

Given the pace of change in the shale gas and shale oil industry it is difficult to capture all the geostrategic implications. There are for example also significant none oil related effects. It is possible for instance that the shale gas inspired onshoring of industrial capacity to the United States is triggering a broader reconsideration across United States industrial concerns of the value of offshoring, resulting in a far greater return of manufacturing to the US than just in respect of energy intensive industries. This knock on effect of onshoring could add significantly to US industrial capacity, prosperity and economic power.

Equally, the shale gas revolution also improves global food security. With the world facing an extra 2 billion mouths to feed the availability of immense quantities of cheap gas widely dispersed across the planet is a major boon to humanity. Natural gas is the principal (approximately 80%) content of artificial fertilizer. Access to cheap gas for the whole of humanity will reduce the prospect of famine and lack of nourishment worldwide.

What policymakers need to appreciate is that the shale gas is not an issue to be monopolized by arguments over 'fracking' (actually hydraulic fracturing). It is a far bigger issue, which will shift the tectonic plates of global power, enhancing the power of some states and undermining others, providing a means to feed humanity, and perhaps for the first time in ensure all humanity has access to heat and light[9].

[9] The IEA's best estimate is that currently 1500 million people have no access to electricity. The danger is that with the projected increase in population in 30 years time we could still have 1500 million with access to electricity. However, with the shale gas revolution we may for the first time have the physical means to connect almost the whole of humanity to gas fired power grids. This is due to the widely dispersed nature of shale gas plays but also to the relatively cheap installation and connection costs of modern CCGT gas fired power stations.

