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Security Policy Library 3-2012

US SHALE OIL REVOLUTION AND THE GEOPOLITICS OF OIL

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Published by: The Norwegian Atlantic Comittee
Editor: Neving Rudskjær
Printed by: Hegland Trykk AS, Flekkefjord
ISSN: 0802-6602

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US Shale Oil Revolution and the Geopolitics of Oil.

On August 22nd 2012 the US Republican presidential candidate Mitt Romney published a campaign leaflet: "The Romney Plan for a Stronger Middle Class: Energy Independence" containing a vision of the US as an "energy superpower"[1]. Energy independence has been the dream of all US presidents since President Nixon launched his "Project Independence" in 1974. The revolution in producing oil and gas from tight formations (shales) in the US over the past 5-10 years has already brought "North American Energy Independence" within reach. Shale formations are widespread throughout the world, and if this US success can be replicated by other major oil and gas consumers it would have far reaching consequences for the geopolitics of oil and gas.

Geopolitics of Oil and the US as an Oil Superpower

The Geopolitics of Oil has an economic and a geological foundation: the importance of oil to the national and world economy, and the geological fact that recoverable oil is not evenly distributed in the world. Large reserves of cheap oil, in the US in the first part of the century, and in the Middle East in the second part of the century and to this date, have been determinant factors. It has created market powers, import dependencies and concerns over oil prices and security of supply that have been high on the international agenda at least since the early 1970´s. The Geopolitics of oil may be understood as the relationship between the *have* and *have not's* of the oil world.

Oil and natural gas have played a pivotal role in the economic development of the US and the rest of the industrialized world. Since the first commercial oil production in Pennsylvania in 1859, the oil and gas industry has to a large degree been an American creation. During a long period the US was the world's largest producer and The Oil Superpower. Large oil reserves were discovered in Oklahoma and Texas in the first part of the last century, and the Texas Railroad Commission played a central role in regulating production volumes and oil prices. A potential US oil embargo in order to force Japan to end the war in China was an important strategic consideration behind the Japanese surprise attack on Pearl Harbor, simultaneously aiming for Singapore and the oil fields in Indonesia. American supply of oil was vital for the Allied victory in WWII. In the Suez crisis (1956)

question marks over US oil supplies to NATO allies Great Britain and France contributed to the old western colonial empires humiliating swansong. The power to determine the *price* of oil, *supply* or *deny supplies from own sources,* and to *control supply routes,* are prime characteristics of an oil superpower.

In the late 1930´s it was recognized that US national production would not be sufficient to cover future demand. US engagement in Saudi Arabia found its political confirmation with the famous meeting between President Roosevelt (en route from Yalta) and King Ibn Saud in 1945. US friendship and security guarantees secured continuation of US dominance in world oil through the heavy involvement of US oil companies in the Aramco consortium. Pricing power gradually passed from the Texas Railroad Commission to the US dominated "Seven Sisters", until power passed to OPEC with the oil crisis of 1973. However, US oil majors have continued to play a central role in cooperation with Saudi Aramco (although fully nationalized by 1980), and the *special relationship* between the US and Saudi Arabia was further developed through large arms deals and broad cooperation.

Volatility of oil prices

We have had a number of oil crises where the *fear* of supply problems (rather than a *real lack of oil* supply) has resulted in physical and financial stockpiling of oil that has driven the oil price to levels previously unthinkable. These price levels have subsequently been underpinned by OPEC production limitations. Conversely, fear of oversupply, concern for market share, and lack of OPEC discipline have created situations of *deliberate oversupply* by Saudi Arabia, leading to prolonged periods of relatively low oil prices causing cancellation or delays to oil production projects outside OPEC. The dramatic price drop in 1986 sharply reduced the export incomes of the Soviet Union-contributing to the end of the Cold War, and the price drop in 1998 triggered the Russian Rouble crisis and default.

Following the oil crisis of 1973/74, the International Energy Agency (IEA) was created with the purpose of promoting solidarity and joint action by OECD members through minimum storage requirements of oil and a joint crisis oil allocation mechanism. At the time the OECD members accounted for the majority of world oil import

requirements. Today we see that China and India – who are not formalized IEA members–follow the policy of Western governments and their oil companies prior to 1974: The national oil companies are regarded as important tools in a government strategy to secure national oil supply, and this consideration takes precedence over concerns for human rights and joint attempts to use trade restrictions towards states considered black sheep in the international society.

Price volatility is strongly influenced by the *lack of flexibility in global oil production*. Excess production capacity is primarily maintained by Saudi Arabia, while the strategic oil reserves of IEA members have not been used in order to calm the market. When crisis is looming, the tendency has always been to hold or to increase oil volumes in storage – as it is only in retrospect the extent of the crisis can be determined. Increasing oil production outside of OPEC takes many years of heavy investments, and when such production is put on stream it will normally run at full capacity regardless of oil price – provided variable costs can be covered.

High oil price drives development of unconventional oil and renewable energy sources

With continued high oil prices during the last 8-10 years and serious attempts to limit climate gas emissions, rapid development of renewable energy sources has taken place in Europe, USA and China. During the same period we have also witnessed a revolution in the development of oil and gas production from widespread shale formations in USA and from tar sands in Canada.

While large reserves of low cost oil is concentrated in relatively few locations, the more expensive oil and gas in tight formations are much more evenly distributed throughout the world. The same applies to renewable sources like solar, wind and bioenergy. Will large scale development of these energy sources reduce the tensions in international energy relations? In my view the answer is a clear yes: provided sufficient capacity is developed. This is contrary to the view that we are entering a resource crisis – peak oil – with escalating conflicts over remaining oil. Provided the oil price remains relatively high, there is a possibility for a more peaceful development of the geopolitics of energy – maybe even its relevance might be questioned: we

do not with the same intensity worry about the geopolitics of agriculture or manufacturing.

The high import bill for expensive oil and gas has been an important contributor to the economic crisis in USA and EU. Development of indigenous energy sources may also be regarded as a mercantilistic attempt at improving trade balances by replacing expensive import with costly and partly subsidized domestic production – without risking countermeasures under international trade rules. In the oil importing countries there are three strong drivers for changing the energy situation:

- Seeking reduced dependence/increased political freedom of action in relation to key exporters like OPEC (world oil) and Russia (European gas)
- Improving trade balance and reducing unemployment by increased domestic production and improved energy efficiency, substituting expensive imports
- Reducing climate gas emissions through energy saving, renewable energy sources and natural gas replacing coal

Expensive measures to reduce emissions are often postponed: waiting for an international binding agreement. For individual nations it pays to wait until everybody is on board, and the cost of being the last to board seems to be low.

The opposite is true of the first two drivers: They are closely tied to the self interest, and it often *pays to be an early mover*. Profitability may be even better if nobody else follows, and oil prices remain high because of unchecked consumption. These arguments are further developed in the "Energy and Climate Roadmaps to 2050" published last year by the EU Commission[2].

Although USA and EU follow different energy paths, it is interesting to observe that significant secondary effects can accrue in the climate gas accounts, also under policies driven by self-interest. There are strong positive effects of global energy saving and development of renewable-and of gas replacing coal in USA, there are also some negative effects like increased use of coal in Europe and tar sand production in Canada.

Source: U.S. Energy Information Administration based on data from various published studies. Canada and Mexico plays from ARI.
Updated: May 9, 2011

US Revolution in oil and gas production from shales

During the last ten years USA has experienced a revolution in the production of *gas* from tight formations, particularly from shales. Import requirements have been sharply reduced, and the gas price has fallen to a third of EU gas prices. Terminals built to cover an anticipated strong increase in *import* of liquefied natural gas are being converted to *gas export*. Large scale use of natural gas as fuel for long distance transport is being planned, representing the first serious attempt to challenge oil as the vital transport fuel. US petrochemical industry sees a strong renaissance with very competitive feedstock prices, due to an abundance of gas liquids produced with the natural gas. Cheap gas replaces coal in power stations, and the US reduction of CO2 emissions is now faster than the EU – even in the absence of a determined federal climate policy.

In the last five years the shale gas technology has also been deployed to develop *oil* production from tight formations. In the enormous Bakken-formation in North Dakota, 200 rigs currently drill

2000 wells annually, and production has increased from 100.000 to 700.000 bbl./day, creating 45000 jobs in the process[3]. This formation has been known for a long time, but the oil has been difficult to extract. It extends into neighbouring states and Canada, is located at a depth of around 3500 meters, and very little oil seems to have leaked from the formation.

Forecast of potential production from such formations in the US varies considerably depending on assumptions of further development of a young technology and improved recovery rates, but it is possible to foresee a production level of at least 2.5 mill bbl./d. Recoverable reserves in the Bakken/Three Forks-formation were estimated at 500 million barrels (bbl.) in 1998. The estimate was increased to 5.3 Billion bbl by 2008, making it the largest US oil field –larger than Prudhoe Bay in Alaska. A new official reserve estimate is being worked out, while industry sources have launched optimistic estimates of 24 billion bbl.

Oil production from formations like the Bakken formation also represents an important addition to global oil *production flexibility*. In periods of low oil price, the drilling of new wells will be reduced quickly, as shale oil is relatively expensive. Production declines sharply from existing shale wells, and in the event of rising oil price the drilling of more wells can be stepped up relatively fast. This medium term production flexibility from a large proven reserve base, may further allow a more *tactical* use of the US Strategic Petroleum Reserve in order to reduce oil market volatility. For oil market participants, these are new capabilities that will need to be taken into account. Their market behavior will be affected whether the capabilities are used or not, and *US will achieve a degree of oil pricing power* alongside Saudi Arabia.

All the oil in the world has been created in geological time under high pressure and temperature in a *source rock,* from which maybe 20% of the oil has since leaked and migrated upwards[4]. *Most of the original oil remains in the source rock.* A large percentage of the oil that leaked may be considered as lost, but some oil migrated to porous and permeable *reservoir* rocks that happened to also be sealed by a *cap* rock.

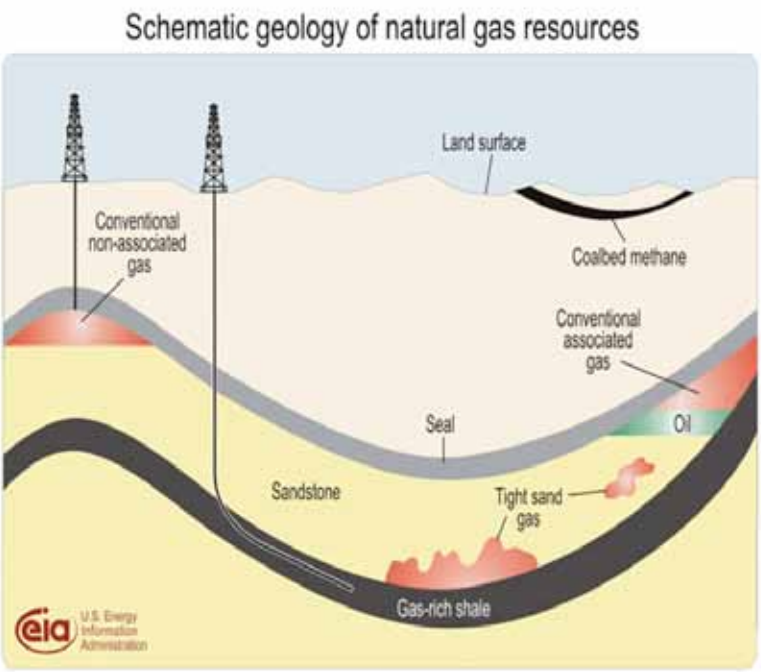
This small fraction of total oil is the basis for the conventional oil fields which fuel our economy.

Vertical wells are drilled into these reservoirs and oil will flow relatively easy for an extended period of time. The large oil companies have traditionally been hunting "elephants", very large oil fields with high production capacity. But the low probability of finding deposits where all of the three criteria are met: source, reservoir and cap, is the reason why exploration risk is high. An expensive exploration well may find no oil! It is also the fundamental reason why a large oil field is a rare occurrence, why oil reserves are not evenly distributed,– and why we have a geopolitics of oil.

The source rocks – like shales–are much more evenly distributed throughout the world.

With the new method, long horizontal wells are drilled within the source rock itself. Water is injected under very high pressure in order to create cracks or fractures in the rock through which oil may flow. This method is called "fracturing" or "fracking" and has been used for a long time in order to stimulate production from old or difficult reservoirs. Development of shale gas and oil in USA was pioneered by small, independent exploration companies. The large multinationals did not believe in this, it was considered to be "manufacturing" rather than oil exploration! After success was demonstrated, the multinationals have entered by acquiring some of the pioneering companies, and this has become a large scale industry. The method has its drawbacks: it is relatively costly, production from each wellsdecline fast so that new wells need to be drilled continuously, and there are certain environmental issues related to water supply, treatment of water and reduction of gas flaring. However, given the young age of the technology and the amazing size of this new energy source, we must assume considerable progress in dealing with all these concerns.

A number of countries have recently started shale exploration programs in order to copy the American success, some have been disappointing, but we are at a very early stage of both exploration and technology.



US Energy Outlook radically changed

The Energy Information Agency (EIA) is the statistical division within the US Department of Energy. EIA issues an annual extensive survey and forecast of US energy demand and supply (American Energy Outlook, AEO). Comparing the AEO issued in 2002[5] with the newly issued AEO2012[6] provides an interesting insight into the energy forecast forming the backdrop for policy decisions 10 years ago and today.

In 2002, prior to the invasion of Iraq, the outlook for US oil production was bleak, while consumption was expected to continue to rise to an import dependency of 62 % in 2020 of which half would come from the Arabian Gulf. Oil prices were assumed to stay around 20 USD/bbl, while increasing global demand would result in the call on OPEC production rising from 30 million bbl/d in 2000 to 57 million b/d. OPEC production would in that scenario increase from 30% of global demand in 2000 to 50% of total estimated global demand in 2020. Whether such an increase in OPEC production was technically

Figure 3. Total U.S. petroleum and other liquids production, consumption, and net imports, 1970-2035 (million barrels per day)

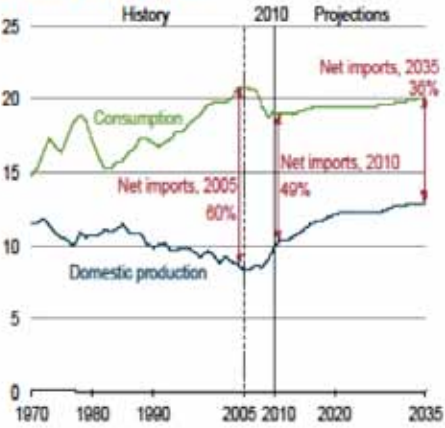
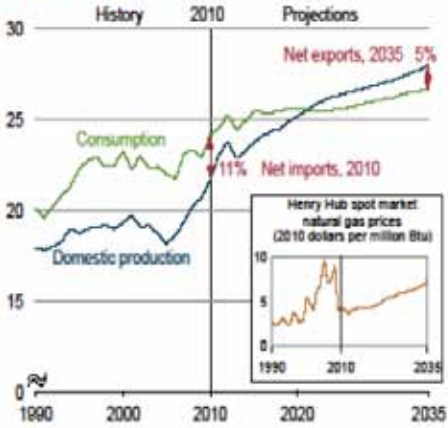


Figure 4. Total U.S. natural gas production, consumption, and net imports, 1990-2035 (trillion cubic feet)



possible was open to question, and whether it could be combined with maintaining a low oil price appeared even more questionable. Saudi Arabia was assumed to play a key role in providing increased production, and Iraq – having the second largest oil reserves – might at least have the technical potential for significant production increase.

In 2012 the forecast is radically changed. Consumption increases have been drastically reduced – caused by high oil prices, lower economic growth and energy savings. Development of biofuel and natural gas as transportation fuels, increased domestic shale oil production hae reduced the forecasted US import requirement to 36 % of total consumption. Increased import of Canadian oil from tar sands and other Western Hemisphere sources has *virtually eliminated the US need for physical import of Arabian Gulf oil by 2020*[7].

The Carter doctrine and US/Saudi relations

In response to the Soviet Union invasion of Afghanistan in 1979, fearing further Soviet advance to the Arabian Gulf, President Carter issued a stark warning:

"An attempt by any force to gain control of the Persian Gulf region will be regarded as an assault on the vital interests of the United States, and such an assault will be repelled by any means necessary, including military force"[8].

This became known as the Carter Doctrine and its scope was in later years de facto expanded to also cover attempts by any Gulf state to establish regional hegemony. US involvement in subsequent events (the Iran/Iraq war, Iraq's invasion of Kuwait/ First Gulf War, Iran's nuclear program, the invasion of Iraq and strong naval presence in order to keep the oil supply lines open) may be understood as reflecting an expanded doctrine and as a confirmation of the vital US interest in the region. In 1979 USA imported 1.8 mill bbl/d from the region (23% of US oil import), roughly the same volume as in 2011.

The US vital interest is not only tied to its own physical import requirements, but rather to the effects that oil price shocks and major supply disruptions will have on *world economic development*.

This interest is likely to remain, even as the US eliminates its import requirement from the Gulf. The EU is attempting a similar reduction of import requirements through energy savings and development of renewables under the ambitious "Roadmap to 2050", and *most Gulf oil will be for Asian customers*, particularly China and India.

China's import requirements will by far exceed what can be sourced from Iran and Sudan. China's recent expansion of oil imports from Saudi Arabia and other Gulf states at the relative expense of Iran may be seen as an indirect support of sanctions against Iran. Chinas export driven growth strategy makes it even more dependent than the US on a healthy world economy and stability in oil prices and supplies. China and the US may find that Gulf stability is a vital joint concern, and an area for cooperation, regardless -to a certain extent- of other frictions.

In the case of major disruptions to Gulf oil supplies and the corresponding oil price increases, it may be assumed that the *US and Russia will be the least vulnerable* among the major powers, due to

their domestic energy position and the relatively low share of external trade.

USA is likely to maintain a strong military presence in the region, particularly naval forces to safeguard supply through the Hormuz strait. Any vacuum created by US withdrawals is likely to be filled soon by.China and India. Seen from China, the strong US presence– although *safeguarding* supply in peaceful times–could also be used to *control* supply in periods of conflict. A number of US allies in Asia will be heavily dependent on Gulf oil supplies, and would not welcome expansion of Chinese military presence at the expense of the US.

Seen from Saudi Arabia, the American desire to free themselves of imports from a country with which it has 67 years of special relations may be considered a confirmation of cooling relations, particularly when this strong desire seems to have a realistic chance of fulfillment. Saudi Arabia established diplomatic links with China as late as 1990, and since then there have been several visits by heads of state. Cooperation projects have been launched in oil exploration, large joint refinery projects and the establishment of a Chinese strategic oil reserve. Criticism of human rights, democracy and other internal affairs may not be prominent items on either party's agenda. Chinese oil imports from Saudi Arabia are already at the same level as the US and rising, and it is not inconceivable that Saudi Arabia might find it useful to establish a special relationship with China as its largest customer. Two special relationships may be better than one, and while the US may supply missile defense systems, any Chinese moderating influence on Iran might also be welcomed.

Conclusions

US shale *gas* development has in 10 years revolutionized the US gas market. The rapid transition from gas importer to forecasted gas exporter has already affected gas markets outside of the US, although no gas export has taken place so far.

US shale *oil* development is only five years old, but is already pointing to radical changes in the geopolitics of oil and American oil independence. The US may again become an energy superpower, and the economic effects could provide important contributions to

economic growth. The gloomy scenarios of US decline in global status may fade out of vogue.

The fears of imminent "Peak Oil" giving rise to escalating resource wars in competition over dwindling oil supplies may be relegated to the more distant corners of the envelope of human concerns.

Shale oil is only viable at a fairly high oil price, and cheap gasoline for US voters is not immediately in sight. Due to the high cost, shale oil should not be regarded as a threat to the development of renewable energy sources.

The flexibility of shale oil production in combination with the US Strategic Petroleum Reserve could provide less volatility in oil prices and a certain degree of US oil pricing power in the medium term.

American independence of imports from the Arabian Gulf will lead to a new freedom of manoeuvrr in US Middle East policy. If being, and remaining, an oil superpower remains a high priority, a continued special relationship with Saudi Arabia (and Iraq) and a strong military presence in the Gulf may be expected.

If

a. progress in development of renewable energy sources is maintained, and
b. shales containing oil are as widely distributed as the International Energy Agency assumes,
c. and if the American success story of exploiting this energy source can be broadly copied,

one might entertain a reasoned hope that the geopolitics of oil will lose some of its past relevance in a not too distant future. The powers of the energy superpowers would be reduced, and world energy relations might become less hostile.

Notes

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8 President J. E. Carter jr., in his January 23rd 1980 State of the Union speech

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