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Marcellus shale gas-drilling site along PA Route 87, Lycoming County. by Nicholas A. Tonelli, Flickr, (CC BY 2.0)



Energy News Blog

The “Lottery Economics” of Shale – Why only smaller companies are successful in the Shale Revolution

–Henrik Vorloeper

The revolution of shale has been a revolution from below. Not Chevron, ExxonMobil or Shell – major oil and gas companies who share the majority of the market and have overwhelmingly large financial assets, – these were not the leaders amongst the development of unconventional hydrocarbon extraction. Predominantly smaller and mid-sized independent companies, those who have limited or no share in the energy sector led the shale revolution and remained there up until its peak. Smaller companies, such as the pioneer among shale drillers, Mitchell Energy & Development Corp., followed by Devon Energy, Chesapeake Energy and Continental Resources [have been the developer of drilling techniques and the driver of the shale extraction in the 1980s and 1990s](#). In the 2000s the number of producers increased, but among them the number of large and renowned companies remains limited and their success modest until today.

Why have smaller companies been more successful in the shale revolution and why do they continue to dominate the shale industry? While analysts provide several explanations for this phenomenon, one of the more feasible answers for both questions is provided by Russell Braziel in his book “The Domino Effect” (2016). The common understanding is that the strength of smaller companies is flexibility, an asset that is less developed in larger companies; but where does this flexibility come from? Basically there are four major drivers behind the success of small companies, the regulatory framework, the geology of shale and the remaining two are linked to the quality of risk assessment exceptional in small companies.

Regulatory Framework

The shale revolution took place in the United States only and this for two good reasons. First, the liberal economic system of the United States provides fertile ground for independent and start-up companies to acquire access to markets barriers to competition are rather limited. The second reason is more specific for energy companies. Below ground minerals are owned by the individual who owns the land above. The state thus has limited, if any opportunities to influence extraction activities. The right to extract these minerals are provided by the private owner only. This makes it tremendously easy for companies to launch drilling activity. This distinguishes the

United States from most other countries, where mineral extraction rights are in most cases licensed by the state.

Geology

The second driver that benefits small companies is the geology of shale. Shale has four specific attributes that distinguish it from conventionally extracted hydrocarbons. First, shale formations can be found very deep below ground. Drilling is possible up to depths of 15,000 feet, but it becomes very expensive and the chances to find shale formation are less likely and thus, riskier. Shale formations in depths lower than 3,000 feet are easier to find, but their hydrocarbon content can be low or nil. Second, shale formations are very different one from another. It is not only the depths, but also the composition of shale formations so that drilling methods used in one hole may not be suitable for a different shale rock composition. For example, if a company was successful in extracting hydrocarbons from one field, the same method does not guarantee success at any other field. Third, shale formations are different in their size. Where drilling and eventual extraction of shale hydrocarbon is possible, there is no guarantee that the project is successful as such. In order to achieve an investment return, the tapped shale field must surpass a specific size. The fourth factor is the amount of hydrocarbons found in shale (so called: Total Organic Carbon, or TOC), which makes some shale formations more attractive to extract independent of their size and location, while for others the TOC can be so low that any extension of extraction does not return the costs of drilling. With these four factors in mind, it becomes clear that shale exploration and extraction is still an undertaking of high risk, almost like a lottery. Equally important, it has a low tolerance of risk reduction, which means that any new drilling project has a very similar high



Shale gas Poland Krynica by Karol Karolus - Own work, CC BY-SA 3.0



risk of complete failure, while at the same time the learning effect of the continuously exercised trial-and-error is significantly low. This is of course a disadvantage for any energy company operating in the shale business. However, small companies tend to have a comparative advantage over large companies in the form of tolerance for uncertainty.

Tolerance for Uncertainty

The risk factor in shale is an advantage for small companies over large companies in that small companies are willing to take more risk. The chances for small and large companies to fail are equally high, while the perceived benefit of success is relatively high for smaller companies. Braziel explains the occurrence, using the viewpoint of a manager in a large company and the viewpoint of an owner of a small company. While an unsuccessful project in a shale formation will have a detrimental effect on the career of a large company's manager, the owner of a small company will risk the survival of his company. But the sole reason for a small company is taking the whole risk, as this is the purpose of the company, while the large company has a rather large number of projects. If the large company is successful in its exploration of a shale formation, the manager of the large company is likely to receive a bonus. However, his incentive is lower than the incentive of his colleague in the small company. For the small company, a successful exploration can be compared with a lottery win for the owner, as he has to share his financial gains with a smaller number of shareholders. The idea of "all-or-nothing" plays the major role for independent companies, and this is what defines their flexibility. However, the explanation is not sufficient to answer the financial risk of small companies. Companies do not know at the beginning how much exploration will cost and how much return the project will provide, so that the risk of having huge losses is high, and the return extremely uncertain. Large companies are unwilling to deal with the uncertainties, as those uncertainties do not fit into a large companies risk assessment strategy. Therefore, their attitude towards investment in highly uncertain shale projects is diminished.

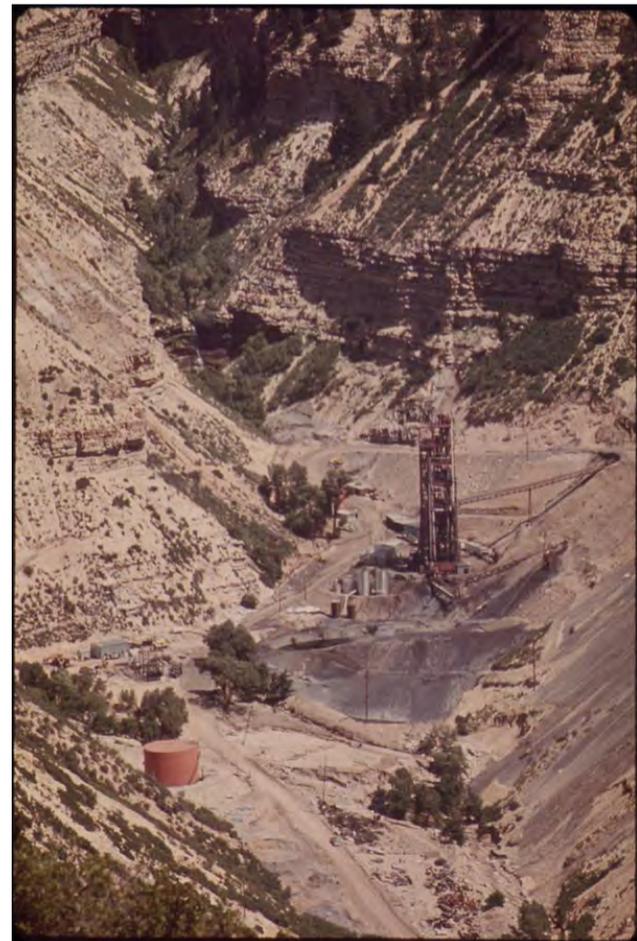
Tolerance for Repeated Failure

Why exactly do small companies have a higher tolerance for uncertainties?

First of all, it is easier for smaller companies to get access to drilling rights, because they can be the owner of minerals if they own the land. It is a precondition for a small company to establish one or more opportunities to drill in shale, but as mentioned, the undertaking bares a large financial risk. One company might have enough financial assets and willingness to take one attempt in which it either fails or wins. Again, if it

wins, the return is a fortune for the small company. The possibility of both failure and success is perceived by private investors as an opportunity to make positive return, if it spreads its investment to several smaller companies with each having one or a few attempts to drill, the chances to make a positive return is higher. For example, if two out of three companies fail in extraction, the third company still can provide a larger return to cover the costs for all three investments and make an additional win. The problems for large companies remain the same; the failure in one project neither reduces, nor increases the likelihood of success in the other project.

Conclusively it should be stated that it takes pioneers, those operators who take risk and whose incentive is driven by the prospect of success rather than fear of losses. This is greatly supported by the US economic system. However, much in the shale sector suggests that it is still a maturing sector in which technologies to reduce the uncertainties of the geology of shale is in development. Combined with the falling global price of oil, the question for the future of shale has to be asked, whether it will be the renowned large oil companies that will find their way into shale, or if a few of the most efficient shale companies will come out as new major companies.



The Colony oil shale development site in August 1973. Public Domain



Brussels Attacks and Global Nuclear Security

–Jerry Byers

The article was originally written for [Russia Direct](#).

The recent bombings in Brussels and the subsequent discovery of information that ISIS militants may have been targeting Belgian nuclear facilities should be concerning. The threat of a nuclear disaster at the hands of terrorists is a global concern, and one that requires all of the major players in the nuclear community to be involved in presenting and implementing solutions cooperatively.

Should we be worried about security of nuclear facilities in Europe?

Most analysts agree the threat in Belgium is real. In a recent New York Times article by David E. Sanger and William J. Broad they state, “And Belgium, where a nuclear facility was sabotaged in 2014 and where nuclear plant workers with inside access went off to fight for the Islamic State militant group, has emerged as a central worry. The country is so divided and disorganized that many fear it is vulnerable to an attack far more sophisticated than the bombings in the Brussels airport and subway system last week.”

The Nuclear Policy Program, Carnegie Endowment for International Peace, in a [video](#), listed four ways that terror groups might generate a nuclear threat.

1. To buy or steal an actual nuclear bomb;
2. To build a bomb using Highly Enriched Uranium that was bought or stolen;
3. To sabotage a nuclear power facility;
4. To build a “dirty bomb”, which is a conventional bomb with radioactive material attached that would be dispersed during an explosion.

Terrorist activity is largely based on the allocation of limited resources towards efforts that create the largest impact. The risk to reward ratio for attacking nuclear targets has typically been high due to increased security measures taken over the last 15 years and most recently during the series of Nuclear Security Summits initiated by the Obama administration starting in 2010.

There is also some evidence that breaching the nuclear threshold in terrorist activities is seen by many terror groups to be crossing the line of what they are willing to do in order to accomplish their goals. Most terror groups are interested in creating change and improving their position of power. A nuclear attack would likely prove to be far more detrimental

than any potential gains. Therefore, only the most extreme groups have typically shown interest in these types of attacks and most of those have lacked the means to follow through. ISIS may be another matter.

However, attacks on infrastructure projects such as a nuclear facility need not induce some type of radiological disaster. Taking a nuclear facility offline could very likely do significant economic damage, as these facilities provide base-load electricity to major population centers, many of which do not have adequate spare capacity. The attacks could very well make a huge impact without crossing the nuclear threshold and would have limited direct bloodshed. Consequently, the “fear factor” would still be in play.

The timing of this threat with the culmination of the [Nuclear Security Summit in Washington D.C.](#) last week is ominous. More importantly, Russia’s boycott of the Summit came at a time when cooperation and leadership between the two largest holders of nuclear materials and weapons, Russia and the US, is needed.

Russia’s absence from the final Nuclear Security Summit is both noticeable and regrettable given the recent threats posed to Belgian facilities. For over two decades Russia-US cooperation in the area of nuclear security has helped to secure vast amounts of highly enriched uranium (HEU) and plutonium throughout the world.

As Matthew Bunn of The Project on Managing the Atom pointed out in an article earlier this year, there have been many successes over the last 20 years resulting from cooperation between the two. “As just one example, in the 1990s, Russian experts found a critical bug in US-supplied software for keeping track of nuclear materials, which could cause material to just disappear from the books; the Russian work benefitted both countries.”



IAEA headquarters in Vienna, Austria. Public Domain



Another one is the removal and security of HEU in Ukraine, enough to build eight nuclear bombs.

Furthermore, Russia's experience and preparedness is substantially better than many of their European counterparts in the nuclear security realm because of their experience. The boycott of the Summit may be a lost opportunity for them to assert themselves as a global leader with an issue that overshadows international politics and is seen by many as considerably more important than economic and territorial disputes.

What needs to be done?

Harvard's Belfer Center for Science and International Affairs lists six ways to improve nuclear security in a video it produced and as outlined by Matthew Bunn.

1. Setting Global Minimum Standards for Security of Nuclear Facilities;
2. Implementation of the minimum standards;
3. Complacency;
4. Consolidate possession of nuclear materials into fewer hands;
5. Building Consistency and Confidence in existing facilities capabilities;
6. Continuation of Cooperative Forums.

Russia has, or could play, an influential role in all six of the recommendations, but their failure to attend takes away a

great opportunity on a world stage to assert themselves in that role.

One of the common themes of concern is in security complacency. Besides the Belfer Center recommendations, many other security professionals have pointed to the lack of "stress tests" on the existing nuclear security measures worldwide. Furthermore, some facilities in Europe and elsewhere fail to even arm their security personnel.

Most experts consider additional screening and follow-up with workers and access at nuclear facilities, not only necessary, but also imperative. There is a large consensus in the nuclear security community that nuclear facilities need to conduct and maintain more thorough background checks. In this regard, the US, Russia, and Europe should be the standard setters. Unfortunately, as the latest events have suggested, facilities in Europe may be some of the weakest links in the chain.

In Bunn's assessment, "It's critical to keep a dialogue among technical experts going. Often, the personal relationships among scientists and engineers built up over years of joint work have provided a back channel of communication that has helped the US and Russian governments overcome problems. The two governments need to find ways to let their technical experts work together. The problem of nuclear security is too important to let political disputes get in the way."



A street in Brussels following the attacks. Public Domain.



No Recovery in Sight for Libyan Oil Production

–Bogdan Polishchuk

The situation in Libya has deteriorated in recent months following the ouster of Gaddafi in 2011. Libya is an OPEC member and has the largest oil reserves in Africa. Bloomberg surveys suggest that Libya produced 370,000 bpd of crude oil in December 2015. However, the country easily topped the paltry figure with its production of 1.6 MMbpd of crude oil in 2011.

The civil war of 2011 in Libya led to the first large drop in oil production. The production of oil after Gaddafi's defeat however was quickly picked back up by rebels who seized the facilities and started selling crude to world markets again. Since then, mismanagement by rebels, deterioration in the security environment and the closure of ports, oil fields and pipelines has led to yet another collapse in the production.

On January 5, 2015 ISIS attacked the largest port in Libya, Es Sider, and set fire to the oil tank at the port. US oil companies like ConocoPhillips, Marathon, and Hess are strategic partners with the Waha oil company operating in the Waha, Samah, Dahra, and Gialo oil fields, using the load ports of Es Sider. In fact, ISIS now controls more than 300 km of Libya's coastline, affecting the transit of crude oil.

International oil producers like Eni and Total also have strategic ties with Libyan oil producers. Libya's Es Sider and

Ras Lanuf ports can together transit more than 500,000 bpd of crude oil, but they have been closed for more than one year due to security concerns.

According to the NOC (National Oil Corporation), Libya plans to resume crude oil production in 2016. The NOC has reported that the company is reopening export terminals and taking initiatives to resolve issues to resume production at the Sharara and Elephant oilfields. However, recent attacks by the Islamic State raise questions on whether Libya would resume production or not.

Additionally, a crude oil glut in the market caused by lower global demand and Saudi overproduction has compounded the complexity of the situation. Libya's entire economy was based on hydrocarbons, and as a result of the slump in production, many Libyans have lost their jobs as the welfare state that Gaddafi set up continues to unravel. Social unrest is at an all-time high, with chaos reigning in many parts of the country. Unfavorable terms of the oil market however are dwarfed by the very real levels of instability and volatility in Libya preventing oil transit. Libyan oil is still profitable... the only problem is getting it to market.

The most organized force in Libya seems to be the resurgent ISIS group. Even if ISIS were to re-establish control in key parts of the country, it would raise a dilemma for the buyers of Libyan crude. Doing business with a terrorist group is illegal under international law. Political considerations would have to be taken into account before any country could commit to purchasing Libyan oil.



Sources: EIA, Market Realist, own analysis



The Week in Review

Saudi Arabia Plans US\$ 2 Trillion Megafund for Post-Oil Era

In the preparation for the 'post-oil era', Saudi Arabia is planning steps to diversify the economy. One of such steps is the IPO and resulting sale of up to 5% in Aramco field by 2018, as announced Saudi Arabia's Deputy Crown Prince Mohammed bin Salman. He announced this in tandem with the unveiling of a mega-fund with cash reserves large enough to buy the world's four largest publicly traded companies. This announcement comes at a time of structural change in the Saudi economy, as the government seeks to reduce the deficit by increasing the prices of fuel and electricity and in general to cut down on wasteful government spending. Moreover, the PIF (Public Investment Fund) plans to pivot away from what is currently almost exclusively a domestic investment portfolio, and to raise the proportion of the fund's foreign investments to parity with its domestic investments. Finally, a "National Transformation Plan" will be announced within a month, delineating the path towards economic diversification and sustainability that will include steps towards generating non-oil revenue streams. Measures will include additional fees and a value-added tax.

[*John Micklethwait, 2016. Saudi Arabia Plans \\$2 Trillion Megafund for Post-Oil Era: Deputy Crown Prince. Bloomberg News, 2 April 2016.*](#)

Rosneft Reports Rise in 2015 Net Profit, Drop in Debt

Rosneft reported a 2% rise in 2015 net profits and a significant decrease in debt, alleviating investor concerns. However, after incurring huge debts in the purchase of TNK-BP in 2013, unease remains concerning the feasibility of Rosneft's plans to raise levels of capital expenditure in order to maintain production in the "browning" fields of Western Siberia. Hit by Western sanctions, the firm has struggled to maintain its level of production in the aging fields, although cost controls have mitigated the effects of a 16% fall in Russian flagship Urals Crude blend (in ruble terms).

[*Vladimir Soldatkin, 2016. Rosneft reports rise in 2015 net profit, drop in debt. Reuters, 31 March 2016.*](#)

Argentina, the EU, and WTO Rules for Bio Diesel

The WTO ruled in favor of Argentina in a dispute with the EU over its bio-diesel imports. The EU accuses Argentina of "dumping" its biodiesel on the European market, claiming they are selling their product at a price below production costs in order to price competitors out of the market. The EU acted on this claim in 2013, placing dumping restrictions on Argentinean exported biodiesel. Argentina, the world's top producer of biodiesel fuel, has called these measures "protectionist" although they also have imposed restrictions on trade in an effort to spur demand for domestic products.

[*Mercopress, 2016. WTO rules for some Argentina claims in EU anti-dumping biodiesel duty row. Mercopress, 29 March 2016*](#)

Papua New Guinea: InterOil to Reduce Spending

Last year, Papua New Guinea Based Inter-Oil "re-structured and streamlined" their business operations. In accordance with this process of reducing expenditures, this past week they announced they will cut spending by around US\$ 170 million for the fiscal year of 2016. The cuts will mostly affect the Papua LNG project, as InterOil looks to improve liquidity and diminish its perceived credit risk. They hope to increase their access to credit as the year progresses as they work in tandem with Total on the LNG project. Gas in Papua-New Guinea's Antelope field is reportedly of excellent quality.

[*Natural Gas Asia, 2016. InterOil to reduce 2016 Spending \\$155-170 mn. Natural Gas Asia, 31 March 2016*](#)



Nigeria: Oil and Gas to Raise up to US\$ 503 million to Fund Expansion

Nigeria's Forte Oil is planning to raise slightly more than \$500 million (100 billion Naira) in order to expand its operations in the country. They will raise the funds through typical capital raising processes such as bond and share offering, the issuance of rights, and through the provision of global depository receipts. They look to expand their upstream operations in order to "bolster" the bottom line in the wake of reported profits in excess of 7 billion Naira in 2015 (up from circa 6 bln Naira in 2014). This comes at a time when Nigeria, Africa's largest economy, is suffering from decreased oil-export revenues while their oil sector has been further compromised by acts of sabotage.

[Oludare Mayowa, 2016. Oil & Gas: Nigeria's Forte Oil to raise up to \\$503 mln to fund expansion. The Africa Report, 31 March 2016.](#)

The Caspian: Bribery Scandals with Unaoil

In 2007, Unaoil (provider of such services as market information, assistance in project development, recruitment of local professionals, facilities, etc.) was contracted by the former Aker Kvaerner to assist with project execution in the Caspian Sea region, including the Kashagan project. In 2011 the current Kvarner was established, taking over a subsidiary the former Aker Kvaerner. The utilisation of Unaoil as service provider was certified by Trace International and audited by PwC. Kvaerner obtained an independent integrity assessment from third-party integrity specialists. However, claims have been made that Kvaerner transferred money to Unaoil through offshore bank accounts. Though this is disputed, payments in connection with projects in the Caspian Sea were allegedly made to Unaoil's account in Monaco, where the company is based, as well as to an account in Norway. Since 2011, Kvaerner has not had any additional projects in the Caspian Sea nor have they used Unaoil as a service provider.

[Red Mist Media, 2016. Kvaerner dragged into major bribery scandal involving Unaoil. Your Oil and Gas News, 1 April 2016.](#)

Gazprom and OMV Sign Documents to Further Develop Strategic Cooperation

Alexey Miller, Chairman of the Gazprom Management Committee, and Rainer Seele, Chairman of the Executive Board of OMV AG, have come to an agreement aimed at further development of the strategic cooperation between the two companies. The signing ceremony was held in the presence of the Russian Federation's Minister of Energy, Alexander Novak, as well as Austria's Minister of Finance, Hans Joerg. Suhail Al Mazrouei, the Minister of Energy of the United Arab Emirates, was also in attendance at the meeting which took place in St. Petersburg.

[Gazprom and OMV sign documents to further develop strategic cooperation. Your Oil and Gas News, 1 April 2016.](#)

Freeze Unlikely as Russian Output Rises.

The freeze allegedly agreed to by the Saudi's and Russians, at the behest of several OPEC countries brought to their knees by low prices, has not deterred the Russian's from expanding their production to post-Soviet era highs. This fact could, as has been hinted, trigger a Saudi output increase, as the largest producers compete to retain market share. Therefore, price volatility and over-supply in all markets seems likely for at least the near future, with the largest producers unable to collude successfully to stabilize international energy markets. Furthermore, Iran never agreed to any such freeze in the first place, and in the wake of sanctions being lifted, Iranian increase in production was seen by analysts as a counterweight to any agreement reached by the other major players.

[Jake Rudintsky, 2016. Russian Oil Output Rises to Record as Freeze in Doubt. Bloomberg Businessweek, 2 April 2016](#)



Russia Maneuvers While Awaiting a US\$ 50 Billion Yukos Ruling

More than a decade after the giant oil company was dismembered and largely re-nationalized, a group of its former shareholders continue to pursue the \$50 billion in damages awarded to them by the Permanent Court of Arbitration in The Hague. Russian authorities are appealing the ruling and will use costly and time consuming legal tactics to ensure the ruling will not be enforced for many years to come, if at all. On March 25, they made their latest counter-attack. Investigators allege they were "close to proving" that Mikhail Khodorkovsky, Yukos's former chief executive, and his business associates had stolen their shares in the company. Vladimir Markin, the spokesman for the Investigative Committee, said the businessmen had rigged an auction for a stake in Yukos in 1995 and then transferred the shares to an array of subsidiaries (shell companies) to disguise the fraud. However, Russia has been making this "dirty hands" argument for years and the PCA, in what could be a landmark precedent for investors, has ruled that no matter how the assets have been acquired, if private assets are appropriated by a government subject to the Energy Charter Treaty, then the government must pay damages. There is no enforcement mechanism that can force the Russian government comply with the ruling, so the issue of compensation should remain outstanding for a long time to come.

[Peter Hobson, 2016. Russia Tries New Tactic Ahead of Crucial \\$50 Billion Yukos Ruling. The Moscow Times, 30 March 2016.](#)

The US Becomes a Large Oil Importer

In the three months since the US lifted its 40-year ban on crude oil exports, the unexpected has transpired. Instead of flooding global markets, US crude shipments to foreign buyers have stagnated. Simultaneously, imports into the US have reached a three-year crescendo in a seeming reversal of a decline in the quantity of foreign crude brought into the American market. As of March 25, the four-week average of imports had reached 7.9 million barrels a day, 9.8% increase over last year. Such an increase is seen as more than an aberration and instead as more of a general trend. US producers have lost the competitive advantage that they had over competitors in selling to domestic refineries during the heyday of the Shale revolution. Consequently, US crude production has fallen by about 600,000 barrels a day from its peak of 9.6 million in 2015. Refineries are buying foreign oil to replace this lost output and storing it until prices reach a more reasonable level.

[Matthew Phillips, 2016. The US is a Big Oil Importer Again. Bloomberg Businessweek, 31 March 2016](#)



The commercial oil tanker AbQaiq at ballast. Public Domain



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