

## **Global Shale Gas Revolution**

***Contributed by IMCZ member Brad Daniel***

The development of shale oil and gas resources is igniting passions in all circles, but in America where the revolution quietly evolved for decades before exploding on the world stage in the last 10 years, the change is already reality. US natural gas prices have fallen to record lows, US manufacturing is banking a huge and unexpected productivity boost, and 600,000 new jobs have been created. There is no global recession in the “shale states”. Who is next? The US government’s Energy Information Administration has estimated that China could have 1’275tn cubic feet (36tn cubic metres) of technically recoverable shale gas resources, Argentina 774tn cu ft and Poland 187tn cu ft, compared to 542tn cu ft in the US.

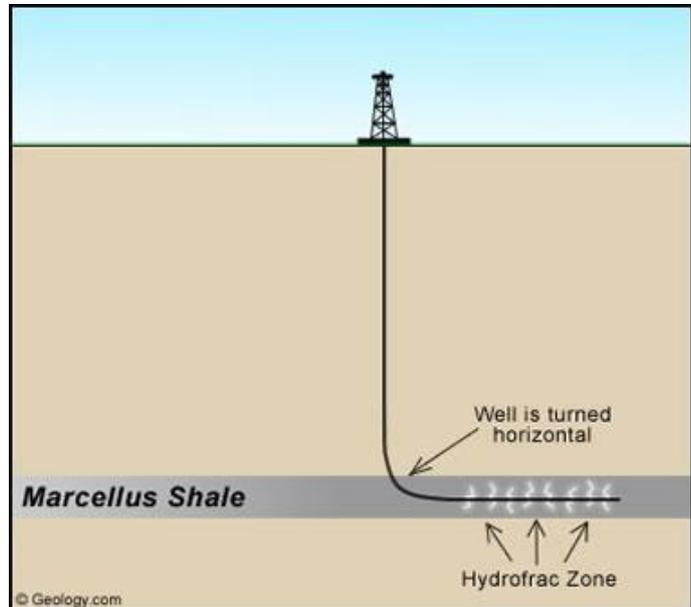
The argument for translating the success to other regions is both a compelling economic case, and also a matter of global importance. With “Peak Oil” meaning that every year more and more conventional oil producing nations join the list of declining producers, and global demand relentlessly rising to keep pace with growing emerging economies, the exploitation of unconventional oil and gas is a lifeline. Energy security is increasingly a matter of national security, with the global economy and subsequent energy demand predicted to double by 2030. Shale gas may extend Peak Oil and thus the hydrocarbon economy for another 20 years. Cleaner renewable energy use is not projected to bridge the gap at only about 5% of the current mix, growth slowing due to removal of public subsidies, and no game-changing power storage technology. The gap will inevitably be filled in the medium term, of 20 to 50 years, by increased use of unconventional resources, and nuclear. The beauty of natural gas is that it is cleaner burning than coal, so will help to reduce CO<sub>2</sub> emissions at the same time as preserving the precious coal assets for future generations and other uses yet unknown. The biggest of these unconventional resources is shale gas. Countries with large resources that are proactively engaging with international oil companies to explore and develop these reserves include Poland, Ukraine, UK, Germany, South Africa, Australia, China. Many other countries have awarded exploration licences but are proceeding at a slower pace while the economic and environmental concerns are debated, e.g. France, Spain, Austria, Bulgaria, Romania.

In Europe, two countries are leading the way:- Poland, and Ukraine. According to estimates they have the largest reserves, though estimates are unreliable as the data is incomplete and decades old. Once more wells have been drilled the data will improve. Poland has between 50tn cu ft and 150tn cu ft of gas potentially recoverable, conservatively enough for 50 years, and possibly 150 years of energy independence from the current suppliers, mainly Gazprom of Russia.

Until today, about 12 exploration wells have been drilled in Poland, with another 10 to 20 wells being drilled in 2012. PGNiG, the largest Polish oil company is predicting commercial production as early as 2014. Most wells so far were appraisal wells, taking core samples and readings to identify where the gas shows and “sweet spots” are for follow up drilling. Once the data is refined, horizontal wells will be drilled, again initially for appraisal and for refining the hydraulic fracturing (fracking) technique needed. Horizontal fracking was developed in the US and involves drilling multiple horizontal wells up to 1km long, and then periodically perforating the well casing with special shaped charges, before injecting large quantities of water, selected chemicals and sand under pressure to force open thousands of fissures caused by the blasting, and so improve the flow rate of the gas trapped in the shale. Flow tests of a handful of wells in Poland so far did not produce a “gusher” that was clearly commercial, but the same was true for many years in the development of some of the now famous

shale plays in the US such as the Barnett Shale and Marcellus shale. The interesting thing about some of the Polish shales, for example in the Baltic Basin, is that the thickness of the rich gas producing shale can be up to 1000m and is several times greater than for example the Marcellus shale.

Once the geology of a basin is understood, a drilling program can be planned, which will usually involve hundreds of wells. The initial disruption is significant during the various drilling and fracking stages, with large amounts of traffic, primarily in the supply of water, sand, and drilling equipment. There is activity around the waste water pumping and recycling process. However once the well completion phase is over, it is often the case that one discrete “pad” can host up to four or eight horizontal wells. The well heads themselves are not obtrusive and there is no noisy plant left behind while the wells produce hopefully for 20 to 40 years. Another consideration is the local infrastructure, both in terms of access and utilities for the initial development, and then gas distribution infrastructure and proximity to a market.



In the USA, the industry grew quietly and did not get the attention of the oil majors until the plays were de-risked and asset values for acreage had already increased dramatically. M&A activity in the US shale business was \$20bn in 2010. With economics stretched now in the US due to the high prices paid for proven acreage and the falling natural gas price, the majors have now turned to the new frontiers like Europe where natural gas prices are 3 or 4 times as high, and the acreage values orders of magnitude cheaper until commerciality is proven. The smaller independents are still involved this time, but the serious players have all teamed up with a major, in order to exploit the cutting edge technology from the USA, where more than a million wells have now been drilled. Exxon, Conoco, Shell and others are all there. Leading the way in acreage is San Leon Energy, which has teamed up with industry leader Talisman Energy of Canada. Talisman is running a 6 well campaign in 2011 and 2012, with encouraging early results.

The story is not complete without discussing the environmental debate. There are risks in all drilling for conventional and unconventional oil and gas, particularly if the well passes through aquifer reservoir rock. There have been some sensationalist accounts of flammable tap water, or small earthquakes caused by fracking. Quadrilla recently had to suspend its UK programme until it was ruled that several thousand minor earthquakes a year take place and that the fracking was not assessed to cause anything more significant than one of these, if indeed there is even a link. Since the lobby movie “Gaslands” was produced, many more studies and rulings have taken place, for example the EU ruled late in 2011 that existing EU legislation covering the industry e.g. around groundwater safety, were already sufficient to regulate the fracking process. Nevertheless, politicians tread carefully around emotive subjects, and we can expect the French to revisit their temporary suspension of fracking licenses once the presidential election is over. The economic implications for Europe, which is struggling to restore sustainable growth and jobs, are much too big for politicians to

ignore in the medium term. And with nuclear less in favour, answers must be found to the energy mix. The companies that are exploring know that if they do not respect the environment the industry will not take hold, so are very



cautious to work with local communities. San Leon Energy recently unilaterally suspended a pilot shale oil programme in Morocco because it was decided it was too near to the important local aquifer.

Mainstream media and politicians are taking notice of shale, with articles in the leading press every week. Whether the Shale revolution is the Energy Event of the century as some proclaim is not yet clear, but I personally suspect that it is, and it will only be a few more years before we can be certain.

Further reading/listening [Wikipedia](#), [Shale Gas Information](#), [Speech by Nick Butler BP](#)