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The shale gas and oil revolution. Sustainability or speculative bubble?

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Over the last few years, the shale oil and gas revolution has generated an almost exponential growth in US productions. In six years, the US has lowered its oil dependence by over 20% and has almost regained its self-sufficiency in gas.[1] According to the EIA[2], this growth could expand. It is believed that the US is to start exporting LNG[3] as of 2017, while continuing to considerably lower its oil dependence. It is expected to import only 15% of its oil from the Middle East around the 2030 time horizon (compared with 75% in 2000) and could export 25% of the world’s LNG capacity.[4] This unexpected influx has imposed a “double punishment” on producers.[5,6]

Between 2009 and 2012, the gas surplus on the US market triggered a spectacular fall on the US currency market. In April 2012, Henry Hub was being traded at $2/MMBtu and European gas at $10/MMBtu, while post-Fukushima Japan was importing it at $17/MMBtu. There are many geo-political consequences to this. The US once again became a “land of growth”, notably in the petrochemicals sector and the sectors that are known to be energy intensive (cement, glass, steel). At the same time, Europe and China are seeing their operating costs soar. The US is switching its coal-fired power generation to gas, while in Europe, on the other hand, cheap coal has prompted the Germans and British to re-open coal-fired power plants. The Americans’ greenhouse gas emissions have fallen by 13%, while in Europe, on the other hand, they started to increase again.

The “double punishment” came in the second half of 2014. In a market of abundant supply (due in particular to the 3 million barrels of shale oil produced in the US), a slump in demand (lower than forecast growth in developing countries, stalled growth in most European countries) and a tense international context (Ukrainian crisis), Brent prices plummeted by 50%, shrinking from $110/b in the summer of 2014, to less than $60/b in December 2014.

Apart from the crash in gas oil prices, a number of experts consider that the future productions and ultimate reserves from unconventional fields are greatly over-estimated.[7] It should be recalled that although the gas and shale plays are considerable, the expected recovery rates are low: lower than 10% for oil and 20% for gas. A slight error in the recovery rate could thus lead to major errors on the ultimate resources. While unconventional wells are seeing their annual production decline at rates of between 3% and 6% for oil and

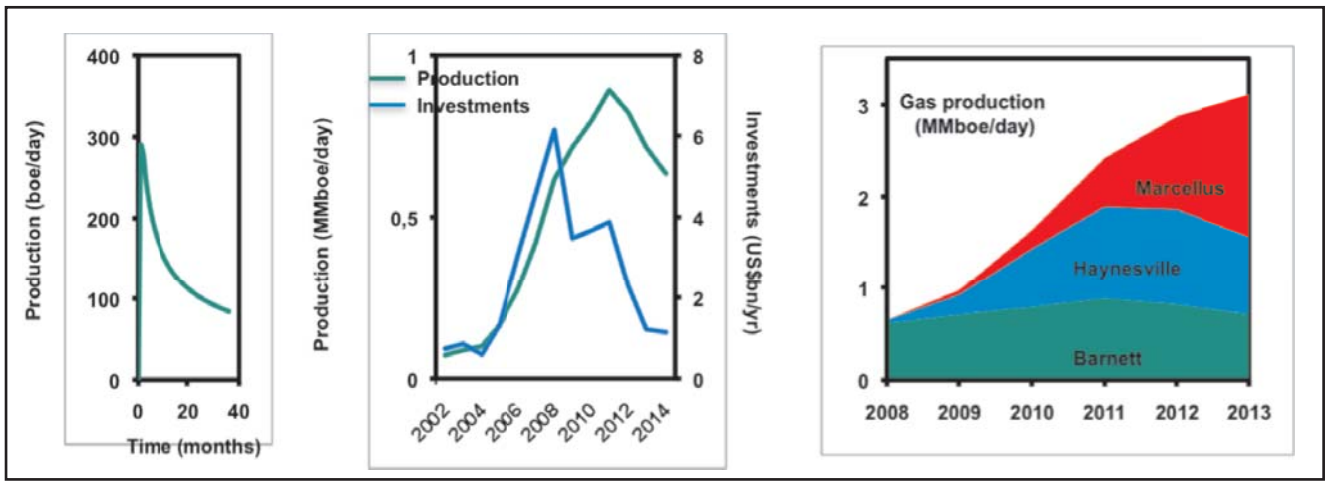

Figure 1 – Decline at Barnett (center) and individual decline of a well (left). Growth at Marcellus (right) (source: Wood McKenzie)[10].

between 15% and 20% for gas, shale oil and gas wells were posting rates of decline of 30% to 40% over the first few years.[8,9] Critics of the "trial and error" method, which involves drilling and fracking new wells "one after the other" in order to compensate for the decline in existing wells, say that such an approach would not be viable in the medium term and would lead to a speculative bubble. The subsequent withdrawal of investors would put a stop to investments and would trigger a swift and significant drop in production. Yet this "catastrophic scenario", as anticipated by some experts, cannot occur in the medium term for at least two reasons.

Play	Resources		Produced		% produced	
	Oil (bnboe)	Gas (Tcf)	Oil (bnboe)	Gas (Tcf)	Oil	Gas
Barnett		32		11.8		37%
Haynesville		77		7.74		10%
Marcellus		275		7.5		3%
Bakken	13.74	16	0.9	0.9	7%	6%
Eagle Ford	11.1	37.1	0.65	2.94	6%	8%
Wolfcamp	8.8	17	0.04	0.25	0%	1%
Total	33.64	454.1	1.59	31.13	5%	7%

Figure 2. US shale oil and gas resources

The first is the resilience of the production of fields compared with investments. The well-by-well analysis turns out to be misleading given the impressive number of wells drilled, fractured and put into production in recent years. Thus, at the end of 2013, North America (US and Canada) had a "portfolio" of around 110,000 wells on fields of varying maturity. Despite the swift individual decline, this reserve plays a considerable "shock absorber" role that helps limit the global decline without having to drill and fracture at a sustained rate. Thus, the significant slowdown in drilling and fracking activities that was started on Barnett at the beginning of 2009 did not lead to a collapse in production, far from it, in fact (see Figure 1).

Secondly, only a weak proportion (5% of resources for oil and 7% for gas) of the huge potential of the American fields (35 billion barrels of oil and 450 TCF of gas) has been produced today. The declines on Barnett (37% of resources produced) and Haynesville (10% of resources produced) were thus largely compensated by the spectacular growth of the giant and more economic Marcellus play (less than 3% of resources produced), of which the development is expected to accelerate over the next few years.[11] Likewise, the huge resources of Wolfcamp are ready to take over from Bakken and Eagle Ford (6% and 7% of reserves produced) when the latter start to decline.

Conclusion

Far from being over[12], the price adjustment cycle is still expected to make producers "suffer" periodically. Yet the activity is already sufficiently "absorbed" to rule out the possibility of a speculative bubble. Although its sustainability is not guaranteed, given the unforeseeable factors affecting the life span of wells and the uncertainties looming over prices, the unconventional sector can adapt itself easily to a "stop and go" strategy. The huge American fleet of drilling rigs (2,000 out of the 2,400 units available across the globe) can be swiftly mothballed then remobilized when prices make it possible. On the other hand, highly capitalistic projects such as those in ultra-deep waters or Arctic regions will not be able to accommodate these. The fall in prices could therefore turn into an opportunity for unconventionals. Yet, in order to ensure its economic sustainability, the "trial and error" model would have to be adjusted, while encouraging the implementation of more scientific approaches. [13,14]

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[1] BP Outlook 2014

[2] Energy Information Agency

[3] Liquefied Natural Gas

[4] Source: EIA annual report 2012

[5] Energy Information Agency
Oswald Clint (2013) "The Dark Side of the Golden Age of Shale Gas and Tight Oil"

[6] Bloomberg article dated May 2014

[7] http://shalebubble.org/wp content/uploads/2013/02/SWS-report-FINAL.pdf

[8] S. Farell (2013), "US Oil Production: Impact of High Unconventional Decline Rates", PCF Energy

[9] A.E. Berman (2012) "After the Gold Rush: a Perspective of Future US Natural Gas Supply and Prices" ASPO conference, 2012, Vienna, Austria

[10] Barnett is located in North Texas, Haynesville overlaps Texas and Louisiana and Marcellus overlaps Pennsylvania and Ohio. Bakken is located in North Dakota.

[11] IHS CERA (2014) "The Evolving Long-Term Outlook for North American Natural Gas"

[12] Gas, which in 2012 was lower than $US11/boe, climbed back to $US30/boe over the very harsh winter of 2013-14. It fell back down to $US23/boe in the summer of 2014.

[13] R. Weijermars (2012) "Assessing the Economic Margins of Sweet Spots in Shale Gas Plays", 2012, EAGE First Break

[14] W.J. Haskett (2014) "The Myth of Sweet Spot Exploration", SPE 170960 SPE Annual Technical Conference and Exhibition, October 2014.