OIL AND NATURAL GAS

Shale Plays – Sitting High on the Cost Curve

AMRITA SEN

In recent years, a key theme in the oil market has been that of disappointing non-OPEC supply growth, despite an environment of high oil prices. Oil companies are struggling to generate substantial returns on their investments; decline rates have stepped up in various areas like the North Sea and Brazil; and existing fields are requiring a higher CAPEX spending on maintenance. This has resulted in challenging issues of feasibility and scalability and hence it has been harder for producers to generate capacity to offset declines in production. Moreover, planned capacity investments might not be achievable at the current budgeted costs. In recent years, infrastructure, material and manpower constraints have been significantly underestimated, leading to substantial cost overruns and project delays. Rising security costs have also played a part, as companies are increasingly operating in countries that are politically unstable.

Amidst the disappointments, US oil production offers a glimmer of hope, with production growth in 2012 at a phenomenal 1 mb/d. Today, US crude oil production has surged past 7 mb/d, the highest in nearly two decades, thanks largely to hydraulic fracturing ('fracking') combined with horizontal drilling that have allowed shale hydrocarbons to be produced more economically. The rapid pace of development has fuelled ideas of energy independence in the USA and a widespread belief that shale production will revolutionise an otherwise ailing non-OPEC supply. For over a year now, the perception has shifted from the notion of oil scarcity to a world awash in oil, thanks to the shale revolution. The natural extrapolation from a world awash in oil is that prices will fall, perhaps quite sharply, as shale revolutionises an otherwise ailing non-OPEC supply and puts to rest the argument of peak oil once and for all. Yet, while shale oil will be a source of substantial new production over the next decade, perhaps the most significant one, it will only do so if the price of oil does not fall too far. Therefore, shale oil is not going to be the reason that we return to an era of cheap oil, simply because if oil (Brent) falls below $90 per barrel for a sustained period of time, it would not be profitable to produce from these sources.

Although exploration success and the shale revolution are providing a new life for the US oil industry, the sector's cost curve remains high. It is the short lead times to bring production online from when the first well is drilled that

work in favour of shale. In theory, US shale production breaks even at $50–$75 per barrel on average, depending on the different shale wells that make production theoretically viable. However, funding the upfront capital costs to hold acreage, to add infrastructure into plays, to do the science required to delineate sweet spots/completion and to drive growth, together with the high running costs of fracking processes, make the total variable cost far more expensive. This has driven break-evens for some of the independent companies well into the $90s. Eventually, offsetting decline in the base also becomes an additional cost burden. A drop in oil prices to $70 per barrel would take some $60 billion out of the system, worth a full year's CAPEX in unconventional oil across the USA. Instead of growing, overall US production would then flatline at best, if not start to taper downwards. A Brent price of $88–$93 per barrel is required to generate enough cash flow to sustain current US CAPEX spend.

The nature of tight oil drilling is very different from conventional production. For example, the natural decline rate of a Bakken well is extremely high, in most cases between 50 percent and 70 percent per annum, producing a severe fall in output in a field unless further fracturing is carried out and new wells are brought in. In this, Bakken is not alone. Judging by production results published by producers, first-year decline rates in unconventional basins look of the order of 50–80 percent, varying by basin and even within basins. They decline steeply thereafter, as well. Thus, the technique is particularly intensive in the use of fracturing crews and other oilfield service industry inputs.

Various CAPEX studies have found that oil and gas companies are likely to invest a record of more than $1 trillion worldwide in exploration and production activities in 2012, a year-on-year increase of 13.4 percent, with North America leading the way. Across that region, CAPEX is set to reach $254.3 billion, representing a share of 24.5 percent of the 2012 global total. Upstream spending in North America grew by 15.7 percent, outpacing the global average rate, with the bulk of the growth coming from shale producers, marking the third consecutive year of US spending gains. Surveys by IHS Herold, Dahlman Rose & Co, and others, offer similar estimates. An oil price of around $90 per barrel (Brent) is a minimum requirement for investments of such scale to be economical and justifiable.

The rapid response of shale oil producers to the sharp fall in oil prices (although Brent still averaged in the high $90s for just two months) in mid-2012, with some rapidly abandoning rigs, was evidence for the high breakeven price. So what makes shale expensive? As highlighted above, the cost of acreage, building out infrastructure, investment in R&D required to delineate sweet spots/completion and high decline rates all make the overall costs for shale production high. Surveys of independent US operators indicate that their drilling plan this year is based on a WTI price projection of above $82 per barrel, while producers start reducing their drilling programmes south of $70 per barrel.

These findings are also supported by the price levels at which US independents have tended to carry out their hedging programmes. Across 2012, an extensive list of US independents had swap contracts in place with an average price of $96 per barrel. The wave of producer hedging for calendar year 2013 began only when WTI prices climbed near and above $95 per barrel in October last year, with the average swap price at $97.5 per barrel. Of course, as plays develop, the industry is becoming more efficient and increasing the number of wells drilled by each rig per year. Increased efficiency is a key reason that the oil rig count might not need to rise substantially from current levels to keep production growing. If downspacing tests (i.e. drilling more wells per acre) are successful in the Eagle Ford and even in the Bakken fields, where new improved recovery techniques are also being trialled, production could grow further. However, hyperbolic decline rates remain a reality in shale plays and this contributes significant costs for shale oil producers, compared to the more conventional oil fields, making high prices a necessity for the viability of shale.

In conclusion, it is high prices that have led to the development of shale oil in the USA just as they have facilitated the growth of oil sands and sub-salt deposits in Brazil. If we move away from $90+ Brent prices, non-OPEC supply will be struggling again. So in a way, shale oil could put a floor on the oil price. However, the growth in these marginal barrels is also likely to put a cap on long-term oil prices, making any runaway increase in average prices much above $110–115 per barrel, beyond deteriorating geopolitical backdrop or in an environment of rapid economic growth, increasingly difficult.