

# Gas Matters

## Stephen Bull's reflections from the frontline of US shale gas

The US shale gas phenomenon has captured the global energy audience with a vigour that few would have predicted just five years ago. An abundance of clichés and tabloid-style banners have been written by consultants, banks, journalists and companies alike, with headlines ranging from the climatic ‘Shale Gale’ to the nationalistic ‘In Shale We Trust’ and the painfully ebullient ‘One Shale of a Good Time’. Leaving headlines aside, there is indeed something significant occurring within the US energy industry, which may have global consequences. Is this a new paradigm? Absolutely. As Tony Hayward, BP’s CEO, said recently at Davos ‘Unconventional gas will transform the entire energy production landscape in the United States... and alters the U.S. energy outlook for probably a hundred years.’ The consequences and effects of shale gas are still in the early stages and a Klondike feeling is still prevalent here in the USA. The spillover of the shale gas paradigm goes further than just redrawing supply and demand curves; it will also affect policy issues, the regulatory and competitive environment and importantly climate issues with global consequences. In this article, the author reports from the frontline of the shale gas revolution, covering a concise history of shale plays, the competitor environment, the gas supply paradigm, the view from Capitol Hill and offers some final thoughts on the future direction of the industry.

### The Compact Shale Story

Shale gas experimentation started in the Texas Barnett Shale in the 1980s, with Mitchell Energy drilling the first well into the Barnett formation in 1981. The Barnett Shale is part of the

Fort Worth Basin where production started from shallow conventional reservoirs in the 1950s. Geologists scanning the basin noticed thick black organic rich shale close to Barnett Spring Creek, named after John W. Barnett who settled in the area in the 1870s. It was declining production from the Fort Worth Basin that pushed Mitchell energy to experiment with horizontal drilling and completion techniques in the play. It was not until the mid-late 1990s with higher gas prices and proven developments in fracture stimulation that the Barnett was seen as an economic success. Devon Energy Corp. initiated the first of the big acquisitions in the US shale play by acquiring Mitchell Energy for \$3.5 billion in 2001. From this point on new shale plays mushroomed including the Fayetteville (Arkansas), Woodford (Oklahoma), Haynesville (Louisiana/Texas) and the Marcellus (Appalachia). Five years ago these names were more geological references; today they are household names in the US gas industry. The list will expand over time including the Eagle Ford, Utica, Horn River, Niobrara, Green River and many others plays.

The shale gas experience is a classic oil and gas story of tenacity, markets, money and technology. The combination of these elements has created a supply picture completely overlooked by almost all analysts as US shale gas production increased eightfold within a decade. The aggressive advances made on the drilling and completion learning curves and the rapid application of latest technologies to new plays cannot fail to impress. For example, it took 22 years for the Barnett to produce 1 billion cubic feet per day (bcf/day) gas production. To reach 1 bcf/day in the Fayetteville it took five years and just three years in the Haynesville. Average Initial Production (IP) rates have consistently moved higher in shale plays, lateral lengths drilled have increased and recovery rates are improving consistently. The average gas output per rig day in the Haynesville and Fayetteville is now

twice that of the Barnett. The service sector has been a key driver in this technology development. Shale gas production is more capital intensive than drilling conventional vertical wells and growth in the horizontal drilling and completions sectors has led to increased industry consolidation from the E&P service industry, as seen in the Baker Hughes–BJ Services merger and Schlumberger’s takeover of Smith International.

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### The Billion Dollar Club

The money has certainly been flowing in terms of acquisitions, divestments and joint ventures within the US shale gas plays. As seen in Table 1 the deal count for USD +1 billion deals came in two phases. After the Devon–Mitchell deal, it was the US Independents that dominated the first acquisition wave around 2005–2007, combining their normal appetite for acquisitions with fast and aggressive organic land grabs. By 2008, a second wave of deals can be observed driven by the dual forces of the Majors seeking new growth platforms and US Independents suffering from aggressive acquisitions and liquidity issues as gas prices fell and credit markets dried up as the economy weakened. If shale gas represents a new paradigm for natural gas supplies, the Majors had to be part of this, acquiring not just long-life resources and growth potential, but also a must have skill set for global applications.

The US shale gas business is highly attractive and distinctly unconsolidated; hence the entry choices are diverse. Statoil, BP and ExxonMobil

**Table 1: US Shale Gas Deals exceeding USD 1 billion**

| <i>Year</i> | <i>Buyer</i>                                                                 | <i>Seller</i>                                                                      | <i>Transaction Value in USD billion</i> | <i>Play</i>                                    |
|-------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------------|------------------------------------------------|
| 2010        | Reliance                                                                     | Atlas Energy Inc                                                                   | 1.7                                     | Marcellus                                      |
| 2010        | Mitsui                                                                       | Anadarko                                                                           | 1.4                                     | Marcellus                                      |
| 2009        | Total                                                                        | Chesapeake Energy                                                                  | 2.2                                     | Barnett                                        |
| 2009        | ExxonMobil                                                                   | XTO Energy                                                                         | 41.0                                    | Haynesville, Woodford, Marcellus, Fayetteville |
| 2009        | BG                                                                           | EXCO Resources Inc                                                                 | 1.05                                    | Haynesville                                    |
| 2009        | Atlas Energy Inc                                                             | Atlas Energy Resource LLC                                                          | 1.01                                    | Antrim, New Albany, Marcellus                  |
| 2008        | Statoil                                                                      | Chesapeake Energy                                                                  | 3.37                                    | Marcellus                                      |
| 2008        | BP                                                                           | Chesapeake Energy                                                                  | 1.9                                     | Fayetteville                                   |
| 2008        | BP                                                                           | Chesapeake Energy                                                                  | 1.75                                    | Woodford                                       |
| 2008        | Quicksilver Resources                                                        | Collins & Young Holdings, L.P.; Hillwood International Energy; Chief Resources LLC | 1.30                                    | Barnett                                        |
| 2008        | Plains Exploration & Production Co.                                          | Chesapeake Energy                                                                  | 3.15                                    | Haynesville                                    |
| 2007        | BreitBurn Energy Partners L.P.                                               | Quicksilver Resources                                                              | 1.45                                    | Antrim                                         |
| 2007        | Atlas Energy Resources, LLC                                                  | DTE Energy Company                                                                 | 1.25                                    | Antrim                                         |
| 2006        | Devon Energy Corporation                                                     | Chief Oil & Gas LLC                                                                | 2.20                                    | Barnett                                        |
| 2006        | TCW private equity (Citigroup, Credit Suisse First Boston, Societe Generale) | CDX Gas LLC                                                                        | 1.17                                    | Barnett, Fayetteville                          |
| 2005        | Chesapeake Energy                                                            | Columbia Natural Resources                                                         | 2.2                                     | Marcellus                                      |
| 2005        | XTO                                                                          | Antero Resources Corp                                                              | 1.04                                    | Barnett                                        |
| 2001        | Devon Energy                                                                 | Mitchell Energy                                                                    | 3.5                                     | Barnett                                        |

have made the biggest bets so far in terms of acquisitions and are serious about global applicability. BG and ENI for example have chosen smaller deals maintaining exposure to technology and gaining knowledge. The latest entrants include 'national' energy companies including Total of

France in the Barnett (with Chesapeake Energy), Mitsui of Japan (with Anadarko) and Reliance of India (with Atlas) both in the Marcellus, the largest and potentially most prolific US shale gas play. What makes the current wave of acquisitions particularly interesting is that

non-US companies are using the US Independents as National Oil Companies. By teaming up with these 'US NOCs' through non-operated joint ventures – and not full out acquisitions – such deals pass with less nationalist scrutiny. One of the strongest cases of the US gas lobby in Washington DC is energy security hence participation from the Norwegians, French, Japanese and Indians noticeably takes a different form than full out corporate acquisitions, as for example ExxonMobil's USD 41 billion takeover of XTO. The failed CNOOC acquisition of Unocal in 2005 still bears lessons for non-US energy companies pondering larger corporate acquisitions. Joint ventures also reduce the human resource risk apparent in making take-overs of companies possessing people with a desirable skill set and knowledge base who may simply leave the company.

### Paradigm Supply Shift

The USA is the world's largest and most studied gas market, yet the rapid supply growth from US shale gas was never predicted. All supply analysts pointed towards two 'facts', falling domestic supply coupled with growing LNG imports and huge scale investments required to develop Alaskan gas. Energy companies expected the same, developing strategies for US LNG imports from Russia, West Africa, the Middle East and South America. In the Energy Information Agency (EIA) 2005 outlook US LNG imports were expected to reach 6 trillion cubic feet (tcf) by 2025. In the 2010 forecast, the figure is around 1 tcf. Last year's report from the Potential Gas Committee (PGC) stated that the USA had a technically recoverable resource base of 1836 (tcf) based on a reassessment of shale gas. Total future supply, which includes the US Department of Energy's proved gas reserves, is estimated at 2074 tcf, a 35 percent increase over the previous evaluation. The report captured the headlines with the promise of 90 years of supply at current consumption rates and another step in the direction of energy security. This kind of

dramatic shift in supply forecasts is rare in the oil and gas world. New frontier basins challenge our existing supply logic, for example the North Sea, or the Brazilian sub salt, but what makes this different is the huge inventory of gas in the USA. Shale gas is cheaper to produce than conventional onshore gas, it does not demand immensely sophisticated technology, it will continue to benefit from technological innovation, and supply is highly reflexive to market signals with low entry and exit barriers. About two-thirds of the US gas production is expected to come from unconventional plays by 2018, implying a different cost curve than previously expected. What makes shale gas different is not limitations on productive capacity or resource availability but the size of the market. All of which represents a paradigm shift, but does DC get it?

### The View from the Hill

The effect of shale gas on future US gas supply has not gone unnoticed in Washington, but gas does not quite capture the attention from Capitol Hill it deserves. Despite natural gas supplying 22 percent of US electricity and representing around 25 percent of total energy use, natural gas has generally been the poor relation in the energy lobbying industry compared to oil and coal. At a recent conference organised by the Center for Strategic and International Studies in Washington, DC Joseph Aldy, special assistant to President Obama for energy and the environment, said that natural gas was indeed 'neglected' in energy policy. The main reason is that natural gas is not viewed as a strategic fuel in terms of national security or dependency. Aldy says that DC does 'get it' when it comes to the national gas inventory created by shale and the environmental benefits of switching from coal to gas for electricity generation, but the industry should not expect special treatment. The US administration though is very happy to see this technology exported to other countries. On the legislation front there are two climate bills doing the rounds in DC (the Waxman-Markey

bill and the Kerry-Graham bill) although it is unlikely that Senators are going to vote for measures that will increase energy prices ahead of the November congressional elections which generally makes Congress more partisan and less productive, particularly after the bitter battle over health care legislation. A climate legislation vacuum in DC may actually help the natural gas industry as the lack of a clear policy on the future cost of CO<sub>2</sub> emissions means few electricity generators are likely to bet on new coal-fired plants. In fact the next wave of coal-fired plants (planned years before) could be the last.

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The short-term gas demand outlook is not bullish, but low gas prices certainly help make the US industrial sector more competitive and the growth in shale gas is providing new jobs in areas of high unemployment, particularly in West Virginia, Pennsylvania and Louisiana. The natural gas industry has never really had a significant lobbying presence in DC previously, but this is changing and the industry is on the offensive against coal. The gas industry is also on the defensive too. The regulatory environment is closely following shale gas drilling, as legislators assess the environmental impacts. The biggest concern is the effect, if any, of hydraulic fracturing (fracking) on potable water supplies. New York State has essentially stopped all shale gas developments in the state pending further investigations. The federal Environmental Protection Agency will begin a second research study to investigate the impact of fracking on water quality and public health. The previous report in 2004 concluded that that there was no evidence that fracking polluted water supplies, but

the report was criticised for focusing on fracking in coal bed methane and justifying an amendment to the 2005 Energy Policy Act that excluded fracking from coverage under the Safe Drinking Water Act. Given the enormity of shale gas resources and public concerns for water quality, the gas industry has to accept that clearance from the EPA is required and, if accepted, would actually boost the case for shale gas as a safe, domestic, reliable and environmentally preferable alternative to coal.

### The State of the Gas Nation

So where are we today? At prices below USD 4/Btu at Henry Hub, the gas market is hung-over after the shale gas supply shock and weaker demand caused by the recession. The market is clearly oversupplied and despite 42 percent less wells drilled in 2009 than 2008, production remains robust. This has been driven by superior production rates from horizontal shale wells vs. conventional verticals. Some commentators claim that the United States is in an unconventional gas bubble. Private drillers have already exited accounting for just 9 percent of the unconventional gas rig count, but 49 percent for conventional oil and gas drilling. Given the state of the economy and little extra switching capacity from coal to gas, the supply side is likely to give before any significant demand growth strengthens gas prices. The main companies drilling for gas will be those exercising drilling carries (Chesapeake, Anadarko, Atlas) and companies that are comfortably hedged or flush with new owners (XTO – supported by ExxonMobil). Further consolidation is likely within the unconventional gas sector implying a shift away from the smaller private players to the mid-sized US E&Ps and their foreign joint venture partners. Larger, more financially capable players in the gas sector may reduce the supply volatility so prevalent before in the US gas sector. This may encourage the conservative power industry to sign up to long-term stable supply contracts at the expense of coal. The implication is a different business model for many existing

players, providing more predictable returns, and the possibility of new entrants including utilities. The USA is sitting on a phenomenal inventory of hydrocarbons and the rest of the world will feel its effect through changes in supply patterns, new sources of demand and quite possibly an easier transition to a lower carbon world.

