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Briefing note

How important is the 'significant discovery' of oil at Horse Hill, near Gatwick Airport?

Wednesday 8 and Thursday, 9 April were unusually interesting for the UK Oil and Gas industry. On Wednesday, Shell announced the success of their bid to acquire BG Group, and on Thursday UK Oil & Gas Investments PLC (UKOG) announced 'discovery' of reserves of 158 million barrels of oil per square mile under their shared licence area at Horse Hill near Gatwick Airport.

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Shell Acquisition

Agreement for the BG acquisition was reached unusually quickly. The rationale behind the deal, and the price agreed (£47 billion, representing a 50% premium on BG's share price) have been the topic of much speculation, raising questions such as "is this a bullish indicator for hydrocarbon commodity prices?"

And if so, how bullish?

In the long run oil and gas prices are expected to rise, as oil and gas are finite resources. The global economy shows a long-term growth trend (about 3% for global GDP) which is still in place despite the recent recession. Demand for oil and gas are closely correlated with global GDP. Despite improvements in efficiency and increasing use of renewables, this growth should prove resilient as requirements for chemical feedstock may persist for longer than those for use as energy sources.

In the short-term supply exceeds demand and this is likely to continue, especially as Saudi Arabia and Russia, the two largest oil producers, have shown no inclination to support the oil price by cutting production. Gas prices tend to show more stability than those for oil, but they are highly correlated.

Developments regarding Iran may also have a significant impact on oil prices over the next few years. Iran has large reserves and is potentially a major oil producer; recent indications of rapprochement between it and the United States, mitigating sanctions, may augment supply. Iran's position is a major concern for Saudi Arabia, but exactly how is difficult to discern, given the complexities of Middle Eastern politics.

Apart from this, outside the United States supply may not be particularly resilient. CEO Kibsgaard of Schlumberger said at a conference last month:

"With the recent 50% drop in oil prices, drilling and completion activity is currently being scaled back dramatically, as the E&P companies are forced to balance investment levels with available cash flow."

On the UK Continental Shelf investment in Exploration, and the very costly infrastructure, have been scaled back in recent years following big increases in the levels of taxation. In the UK, the industry has claimed to be the most highly taxed of all businesses, contributing as much as 24% of all Corporation tax. The US Energy Information Administration (EIA) has stated that high taxation, as well as increasing technical difficulty, have contributed to the sharp decline in oil production from the UK Continental

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shelf since the peak in the late 1990s at nearly 3 million barrels per day. It is now around 900,000 barrels per day, equivalent to about 60% of UK demand. The average quality of North Sea oil is also declining.

Conventional drilling is becoming less and less successful and big discoveries are increasingly rare. The replacement ratio, the rate at which current production is replaced by new discoveries or extensions to existing fields, was close to 200% in 2011 for the world's largest oil and gas groups, including Shell. These groups reduced their reserves by more than a billion barrels in 2014. The replacement ratio has been falling steadily since 2011 and is now around 100%, putting pressure on Shell.

An assumption underlying the Shell/BG deal is that the Brent crude price will reach $90 a barrel by 2018; today the price is just under $63. Many in the industry are bullish but less optimistic than this; recovery to around $70 by late this year is a popular view.

The difficulty with this is that the oil price is notoriously hard to predict with any confidence more than a year or two into the future. It is almost impossible to find a good rationale for any price prediction beyond a few years, which means the proponents of a forecast have to defend a position known to be almost certainly wrong from the outset. Usually, the assumption will be a conservative 'no change' or a modest increase, which feels prudent, but is it? Is predicting $70 by late 2015 really any more credible than $90 by 2018?

Typically, a successful new exploration venture will take three to five years before reaching 'first oil'. Production could extend for 20 to 40 years beyond that point. This makes valuation extremely difficult. So why did Shell make this offer for BG? It may be because it will increase their reserves by at least 20%; acquisition may be cheaper (and less risky) than exploration. Alternatively, it may be a cultural choice; Shell does things the Shell way. They may be able to add considerable value to BG assets just by bringing complementary strengths and the Shell management culture to bear. The acquisition boosted sentiment across the whole oil sector; further encouragement came when UKOG announced a 'significant upgrade of the Horse Hill discovery'.

Horse Hill upgrade

Further encouragement came when UK Oil & Gas Investments PLC (UKOG) announced a "significant upgrade of the Horse Hill discovery."

On 30 January, UKOG announced their alliance with NUTECH, a reservoir specialist based in Texas. Augmenting their own analysis with that of NUTECH, the company announced the biggest oil find onshore for 30 years, which 'if all recovered would double what the North Sea in its entirety has produced so far'. The total Oil in Place is estimated at 158 million barrels per square mile and 'there could be up to 100 billion barrels of oil onshore beneath the South of England'.

UKOG said "with the help of NUTECH's considerable global knowledge base and play library, we have identified that the Horse Hill Upper Jurassic rock sequence is analogous to known oil productive 'hybrid' reservoir sections of the Bakken of the US Williston Basin, the Wolfcamp, Bone Springs, Clearfork, Spraberry, and Dean Formations in the US Permian Basin and the Bazhenov Formation of West Siberia.

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The US analogues have estimated recovery factors of between 3% and 15% of Oil in Place."

Our view: this announcement should be treated with cautious optimism. 7.2MMBO of Oil in Place (4.6%) is in Portland Sandstone. This discovery was reported previously; it is a relatively simple, well understood classic conventional reservoir, with porosity estimated at 27% (which is very good). The new discovery relates to rocks underneath the Portland Sandstone, most importantly the 'Kimmeridge' which is a series of mudstone and limestone layers totalling a decent 511 feet of Net Pay. The NUTECH report says:

"Fracture analysis, together with information from offset well information, indicates that the Kimmeridge shows good evidence of natural fracturing, particularly in the Middle Kimmeridge Limestone 1 and 2 pay sections."

These two sections total 78 feet of Net Pay, and are estimated to include 15.7MMBO of Oil in Place per square mile.

At first sight, these are very good indications for UKOG, and by extension perhaps for the whole Weald Basin (1100 square miles), which includes the Horse Hill area. The natural fracturing should imply that the reservoir can be produced 'conventionally', i.e. without contentious fracking. The significant unknown here is the 'recovery factor' which thus far has been estimated only by analogy. This is normal practice, but very uncertain – even the 15% 'high' estimate quoted is five times larger than the 'low' estimate, and these values are derived from distant analogues in the USA.

The recovery factor is of primary importance, reflecting both technical recoverability and commercial viability, and its estimate should reflect both 'uncertainty' (a state of mind arising from lack of perfect knowledge) and 'variability' (an objective state of nature: one reservoir is not the same as another, and there will be plenty of variability within a reservoir).

The choice of analogues is surprising, and may reflect a US-centric view on the part of consultants in Texas. NUTECH emphasises the analogy of the much older Middle Bakken limestone and Wolfcamp/ Bone Springs formations in the USA and a third formation in Russia, the Bazhenov in north-western Siberia.

The USA analogues would be a good choice for positioning the Horse Hill prospect for development in a similar way, but this is not proposed for Horse Hill. The Russian analogue looks much the most apt, though still distant geographically. It covers a huge area, is much deeper, and in the Soviet era at least 200 wells were 'drilled and produced with highly variable rates and recovery factors'. It may be preferable to compare Horse Hill with the much closer Paris Basin, which is also known to contain oil, and has similar rocks of a similar age.

We are very cautious about extrapolating potential reserves for the whole Weald Basin from the results from one well. Horse Hill may be in a 'sweet spot', so much above average for the Weald. The British Geological Survey estimated onshore Oil in Place in Southern England (Weald and Wessex basins) to be between 2.2 and 8.5 billion barrels; 4.4 billion at P50. Multiply this by a technical and economic Recovery Factor to get reserves, if the public is willing to permit development and the fiscal regime

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tolerable.

We suggest this should remain the benchmark for the time being.

The Wessex Basin includes Western Europe’s largest known onshore oil reserve at Wytch Farm, in Dorset; it was acquired by Perenco from BP in 2011 at a total cost of $610 million. According to the Wytch Farm field development plan of 2012 it contains a P50 mid-estimate of 795 million barrels of Oil in Place, of which 318 million barrels is considered recoverable. The implied recovery factor appears to have been based on a very conservative oil price: $15 a barrel. At 40%, this looked attractive; viability at Horse Hill looks very marginal.

UKOG was founded in 2013 and has been very active in acquiring licences. Optimistically, they said on an earlier occasion (25 March) that there could be more than 100 million barrels of oil beneath the Isle of Wight, based on analysis of the P1916 area, which spans both Onshore and Offshore areas of the Isle of Wight. Specifically it has studied the M prospect, in the south-west portion of the island, where the company believes there are two reservoir types: a Portland Limestone target and a Triassic Sherwood Sandstone, which would be like the nearby Wytch Farm field.

Putting the possible reserves in context, at the end of 2013 the Government estimated Ultimate Recovery of UK oil from the Continental Shelf (offshore) at (P50) 31,746 million barrels, with a low (P90) estimate of 29,238 million barrels, and a high (P10) estimate of 34,225 million barrels. Of this, 26,275 million barrels have been recovered.

Thus the remaining proven reserves were 2,963 million barrels (P90), possibly as high as 7,950 million barrels (P10), with a ‘best’ (P50) estimate of 5,471 million barrels. The largest component of the P50 estimate was in the Central North Sea (2,259 million barrels); most of the rest is in West of Shetland (deep water and very expensive) or Northern North Sea. Wytch Farm’s 318 million barrels recoverable would add about 5.8% to the P50 reserves.

The Horse Hill licences cover about 55 square miles. If these were exploited and the recovery were to average 5% of 158 million barrels per square mile, all highly speculative, that would add about 434.5 million barrels, nearly 90% of current UK demand for one year. The NUTECH report indicates that (only) 25.9 million of the reported 158 million barrels per square mile are in either the Portland or one of the three Kimmeridge Limestone layers, which could be producible conventionally; any production from the other layers may require a quite different and less viable technical approach.

In addition there are ‘possible additional resources’ of oil which may add 5,757/15,077/30,763 million barrels (P90/P50/P10 respectively); there are no current plans for development of these discoveries, which are either not technically producible or not commercially viable. These estimates were derived by aggregating individual probabilistic estimates from each producer.

Onshore production, thus far, is very much smaller. For proven and probable recoverable reserves only Wytch Farm is really significant, but this could change very rapidly given a favourable technical wind for Horse Hill and similar, and a public will to see this developed, leading to development permission from The Department of Energy & Climate Change (DECC). China National Offshore Oil Corporation (CNOOC) is already the largest producer in the (UK) North Sea, and is expected to continue seeking new licences. We expect a shift of emphasis towards gas, rather than oil, and for Onshore the mood

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should be towards interim caution rather than permanent scepticism.

We await more detailed technical results from the Horse Hill flow analysis (expected later this year), and a real, validated reservoir model and production forecast, with great interest.

Projections for future production tend to be more optimistic from the industry than from DECC.

Conclusion

Given current low oil prices, the Shell/BG deal and the Horse Hill finding are both expected to lead to an increase in mergers and acquisitions, as optimistic cash-rich buyers such as CNOOC snap up assets at what may be bargain prices. Following decreases in tax announced in the 2015 budget, several North Sea operators such as EnQuest have said they will increase investment in new Exploration and Production. For others, exploration is getting more expensive and financing harder to find. A deeper, professional understanding of the uncertainties and risks involved, applying actuarial expertise in tandem with the industry, to the complex risks of Exploration and Production, could add confidence and ease the way for both the industry and its financiers.

Please contact your Barnett Waddingham consultant if you would like to discuss any of the above topics in more detail. Alternatively contact us via the following:

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