Will unconventional oil and gas impact deepwater developments?

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BP's Head of Technology, David Eyton, made this speech as part of a discussion at the Offshore Technology Conference in Houston – a yearly gathering where specialists debate the latest innovations for producing oil and gas from beneath the seabed.

The subject for debate was whether offshore deepwater exploration and production will be affected by the boom in onshore 'unconventional' oil and gas development from low permeability shale and tight rock formations.' These unconventionals require use of technologies such as horizontal drilling and hydraulic fracturing and have experienced rapid production growth in recent years. But will this mean a fall in deepwater activity? Speaking alongside representatives from Shell, Statoil, Anadarko, Marathon, Nobel Energy and Global Energy Strategies, David Eyton argued that there is place for both these unconventionals and deep water in the world's energy system – and indeed that there are many aspects of technology common to both which can underpin a portfolio such as BP's, which includes both unconventional and deep water operations.

As BP's Head of Technology, you won't be surprised to hear that I believe that technology is a major factor in addressing the question of whether the unconventionals revolution will impact deepwater developments – and I am specifically referring to tight rock and shale plays here.

New oil and gas resources

Our analysis of long term energy trends suggests that both oil and gas will continue to play an important role in the total energy mix, and that technology could enable any reasonable forecast of increasing global demand to be met at least through to 2050. Shale and tight resources comprise the most significant change in this picture over the past decade.

Prospectively we see exploration, unconventional gas and EOR on conventional oil resources as having greatest potential to add quantitatively to today's resource base through to 2050.

BP's deepwater and unconventionals portfolio

BP is a major investor in both deepwater and shale and tight resources globally. In our view there is space for both resources types in the world's production mix.

However as an indicator of the different nature of these businesses, BP has recently announced the formation of a separate business to manage its 'Lower 48' onshore oil and gas operations. This change is chiefly intended to improve businesses competitiveness through greater speed of innovation, faster decision-making and shorter cycle times from access through to production, together with more efficient cost management.

Deepwater

Deep water is characterised by the sheer scale of individual developments with high upfront capital requirements. Economically, well productivities and drainage areas must be orders of magnitude greater than those for unconventional wells. Paybacks are longer but so too is the available margin before tax, at least for oil.

There are unique technology challenges for deep water including:

- Managing offshore and subsea risks. Life cycle integrity is key. Innovative inspection technologies are being marinized for deep water applications. Digital Radiography is an example of such technology, which we will be deploying in our deep water assets this year.
- High well and completion cost. There are technology challenges in bringing drilling costs down, reducing drilling downtime and ensuring higher life time integrity, particularly in sustaining production and water injection in sand prone reservoirs.
- Imaging subsalt. Finding resources and reducing subsurface uncertainties remain our 'bread and butter'. Higher bandwidth, full azimuth type seismic imaging solutions and proprietary processing algorithms help us to see structures better under complex overburden and sub-salt canopies. That is one of the reasons BP has just opened its new 2 petaflop High Performance Computing Center in Houston.
- Enhanced oil recovery. This needs to be planned from day 1, especially in deepwater developments. For example, we are now implementing LoSal in the UK North Sea and developing plans to do the same in the GoM.
- HPHT resources offer significant upside potential. The Paleogene is a good example with very large amounts of petroleum in place. This is a new technology horizon, and has some parallels with unconventionals. BP's Project 20kTM is aimed at unlocking fields like Kaskida and Tiber.

The onshore operating environment varies significantly around the world. The confluence of market scale and freedom, alignment of surface and subsurface interests, and access to capital and innovation, enabled the recent unconventional phenomenon in the USA – the technologies were not really new, but the application was.

Technical capabilities can be developed or transferred, and similar rocks exist elsewhere in the world, but the other circumstances which enabled the transformation in the USA may not be so easily replicated.

Gas markets are demonstrably regional, driven by the energy density of natural gas relative to oil and its refined products. Therefore the attractions of unconventional gas are highly dependent on regional gas pricing, as well as other factors.

The global potential of shale and tight resources is highly uncertain, especially in respect of tight oil. However, shales contain vast quantities of oil and gas, and may compete with other resources with likely higher cost of supply, such as the arctic, heavy oil and HPHT resources.

Furthermore, the modular nature of unconventional wells and scope for experimentation in the field have driven, and can be expected to continue driving, the learning curve faster than in deepwater.

There are various unconventional technology challenges.

- Operators face the challenge of reducing environmental footprints, where intensive fracturing and high well density schemes are required, addressing issues such as fresh water, chemicals, land usage and local disruption. We have seen progress in fracture efficiencies and the move to pad drilling, but we have more to do.
- Subtle heterogeneity can make big differences in productivity in shale, but detailed rock properties are difficult to assess ahead of the drill bit. Early indicators of fluid quality and permeability and identification of fracture systems will help to identify the sweet spots.

- For fracturing, the challenge is to continuously improve, leveraging other technology developments like seismic, an integrated subsurface model which takes account of rock fabric, local stress orientations etc, and direct feedback loops during drilling and operations to assist learning and fast decision making.
- Automated and improved drilling efficiency will need to move on. This also requires dedicated operation models, suited to the local areas.
- But recovery factors are generally low for liquids. Artificial lift and novel EOR for tight rock can potentially open up this liquids window further.

Synergies between deepwater and tight rock technologies

Turning now to the relationship between unconventionals and deep water, there has always been competition for resources, whether human, financial or in the supply chain, but this is not just between these two resource types, and in any case there is a wide variation in quality within them.

In reality, we also see technology synergies between them.

Those companies which are R&D intensive and participate in both play types can exploit synergies in areas such as imaging, fracturing, sand consolidation, enhanced recovery, and artificial lift. Operators in both can also evaluate and optimise whole systems through distributed sensing, data analytics, integrated modelling and prediction and automation.

Of these, automation and digital optimisation could be the most impactful technology development in reducing both risks and the cost of supply, particularly for onshore unconventionals.

In summary:

- We see a place for both deep water and unconventional resources in the world’s energy system;
- They have different characteristics
- And some common technical challenges

Investors have multiple objectives in investing in companies, and in particular in striking a balance between risk and reward. The risks and attractions of investing in DW and unconventionals are markedly different, varying by region, play and resource type (oil vs gas). Technology developments will impact this balance over time.

Nowhere will this be more obvious than here in Houston. North America occupies a unique space in the world's energy innovation landscape, given the enormity and diversity of its resources, capacity for innovation and access to capital.