

Developing new technologies to meet expanding demand



By **Bob Dudley**

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In the world of energy there are few nations that can rival Russia, the host of the 2014 World Petroleum Congress. Today, Russia is a world leader in the production of oil and gas and has vast resources that offer even greater potential for tomorrow. And while acknowledging its vital importance to global energy supply today, it is important also to remember that Russia is an energy industry veteran.

Russians were extracting and refining crude oil in the Caspian and North Caucasus regions in the mid-19th century. Several of the world's biggest producing oilfields are in Siberia, including Samotlor, a resource that continues to produce large volumes of crude oil some half a century after its discovery. Reservoirs like these can, with the right technology, continue to provide energy for many decades to come.

Our industry has always been a pioneering one, deploying the latest technology to bring energy to our homes and workplaces from increasingly remote and challenging surroundings. Today these include ultra-deep water, extremes of heat and cold and complex geological formations such as those containing shale and 'tight' gas and oil.

The industry is constantly developing new technologies to enable us to find and then produce these reserves to meet the world's expanding appetite for energy. According to the *BP Energy Outlook 2035* we expect the demand for energy to increase by as much as 41 per cent between 2012 and 2035, based on current and expected trends in demand, supply, policy and technology.

Demand continues to rise with improving living standards in the developing world. However, we are increasingly confident that the incremental demand can be met if the resources that undoubtedly exist below the ground are matched by investment-friendly conditions above, including open markets, open access and policy frameworks that encourage competition and innovation.

This is being seen most notably in the so-called 'shale revolution' driven by technological advances in directional drilling and hydraulic fracturing. This is now extending from North America to Russia, China and other parts of the world. Meanwhile, explorers will extend the reach of offshore oil and gas drilling into even deeper water. Several nations, including Russia, want to extend the exploration horizon into the

Arctic. These areas offer huge opportunity but they also involve major challenges.

So what are the major priorities for the industry in this context? The oil and gas industry's first task is to ensure that its operations are safe for people and the environment. Added to that responsibility is the need to provide financial returns to shareholders, as well as providing energy for customers and revenues for governments. The cost of producing the marginal extra barrel in deep-water offshore and in heavy oil and tar sands is growing. Cost pressures coming from two directions are affecting the economics of oil and gas. On the one hand, we see shortages of equipment, rigs and skilled personnel, all of which drive up the costs for explorers. On the other hand, we know that governments are under pressure to deliver more and better public services to their populations. They need to strike a careful balance between the demands of public spending and the need to stimulate investment.

It is no secret that the oil industry is currently engaged in a drive for capital discipline, greater efficiency and lower costs, a new mind-set that is to be expected after a long period of high investment. However, for innovative companies, the challenge can also have the good effect of stimulating new thinking and encouraging the fittest to adopt new ways of doing things.

The lesson we have repeatedly learned in challenging times is that technology is frequently the key to unlock the opportunities.

For example, at BP, we are deploying new ways of acquiring seismic imaging onshore which can cut the time it takes to survey exploration acreage by as much as 80 per cent. At the same time, we have invested in the world's largest supercomputer for commercial research. Based in Houston, it can process two thousand trillion calculations per second, powering our research into the next wave of seismic imaging technologies. In several fields in the North Sea and in Azerbaijan, the technique of 4D seismic enables us to detect changes in a reservoir over time. In this way, we can optimise a field's development to maximise recovery.

State-of-the-art frontier technology is a bonus but the greatest gains can sometimes be achieved by looking at the familiar in a new way. Instead of looking ever further afield at greater expense, the prize can sometimes be found beneath our feet. By improving recovery from existing producing oilfields, the world could, we believe,



achieve very significant increases in oil production at relatively low cost. On average, worldwide, only 35 per cent of the oil in place is recovered from the reservoir. An improvement in the recovery rate to 45 per cent would contribute an additional 1 trillion barrels, the equivalent of about 30 years of global oil demand, at current rates of consumption.

At BP, we have developed several proprietary enhanced oil recovery, or EOR, technologies which can significantly improve oil recovery rates. For example, our scientists discovered that the recovery factor achieved by water flooding mature oil reservoirs could be raised by between 5 and 10 per cent by using low salinity water to displace trapped oil – a technique known as LoSal® EOR. We believe LoSal® EOR has the potential to unlock more than 500 million barrels of incremental oil from across BP's portfolio. The world's first full-scale deployment of LoSal® EOR will take place at Clair Ridge, in the North Sea. Due to start up in 2016, we estimate that we will recover an additional 42 million barrels through LoSal® EOR, at an incremental cost of just US\$3 per barrel.

LoSal® EOR and similar innovations, including BP's Designer Gas™ EOR technologies, have been tested and proven at several giant, mature oilfields, including Prudhoe Bay in Alaska. The Prudhoe Bay field was discovered in 1968 and at the time it was believed that only 9 billion of the 25 billion barrels of oil in place were recoverable. However, last year the cumulative total of barrels produced exceeded 12 billion. EOR technologies will play a key role in increasing our original recovery estimate of 38 per cent to more than 60 per cent.

Recovery can beat discovery

At the Rumaila oilfield in Iraq, a supergiant field discovered in 1953, BP has worked with our Chinese and Iraqi partners to achieve a 40 per cent increase in the output of the field over a period of three years, using BP's reservoir management and depletion planning expertise. In fact, we now believe that the potential gain in output

from applying EOR technology to known hydrocarbon resources exceeds the potential from new discoveries.

We are now looking ahead to a new generation of major projects which will deliver energy from giant fields for many decades – examples for BP and our partners include the Shah Deniz 2 project in Azerbaijan, supplying gas to multiple countries as far away as Italy, and the new Khazzan tight gas project in Oman. We can be confident that new technologies will be developed in the coming years that extend the life of tomorrow's projects as well as today's.

The world in which oil companies and oil producing nations make their living today is almost unrecognisable from the world as we saw it less than a decade ago. New drilling technologies have upset the dynamics of supply and made the world's biggest oil consumer – the US – almost self-sufficient; worries about peak oil have evaporated; major new developments are underway in Russia; but at the same time the physical and economic challenges of producing energy have increased.

Businesses and nations that thrive in this demanding new environment will need to be fleet of foot in seizing opportunities. But above all, they will need continual advances in technology, developing new innovations, integrating them into existing operations and maximising the benefits they deliver over time. ■

The oil retention linkage that LoSal® EOR breaks

