The race to embrace technological change

Can the oil companies of the future maintain their operational integrity and meet global energy demand whilst satisfying shareholder expectations? Ruud Weijermars* *and* Crispian McCredie, *Alboran Energy Strategy Consultants, assess the outlook.*

Society's expectations for the energy business are incredibly high – consumers expect a constant supply of cheap energy, investors want a steady stream of dividends, and governments want security of supply and adherence to climate change protocols. At the same time, the changing realities facing the oil and gas industry include operational challenges that require fast technology innovation. Oil and gas already accounted for 55% of the energy mix in 2010[1], but this portion must grow to 60% in 2040.[2]

Regrettably, renewable energy at present cannot be produced much cheaper than fossil fuels and, therefore, will not displace them overnight. Energy alternatives are costly too. For coal-to-liquids (CTL), gas-to-liquids (GTL), natural gas liquids (NGL) and biofuels, there is a price to pay at the point of production that is above that of West Texas Intermediate (WTI) or Brent Blend.

This applies equally to nuclear power. In Europe, newbuilds face budget over-runs and technical problems. The costs of constructing new nuclear power stations are rapidly increasing, with few companies willing to commit, and governments seeking to share risk with private funding initiatives will find few takers. The nuclear power option is fast becoming only a dream, as governments begin decommissioning their ageing nuclear power stations post-Fukushima.

All these developments fit with the best trend extrapolations from BP and ExxonMobil, which project that fossil fuels will still account for 77% of the world's primary energy supply by 2040.[1,2] Growth in the renewables' market share will result mainly from replacing some of coal's share in power generation, and is forecast to grow to 18% by 2040. However, Shell thinks renewable sources can grow further, supplying as much as 30% of global energy by 2050.[3] Indeed, the share of renewable energy may, by 2050, have more than doubled (quadrupled in absolute terms) compared to 2010. Although the technology for renewables is 'available', it commonly takes 30 years for each specific renewable energy technology (solar, hydro, wind, biofuels) to reach 'materiality' – defined as 1% of the world energy mix.[3]

Technology investment

To meet the growing demand for all energy supply systems (oil, coal, gas, nuclear, biofuels, hydro, solar and wind), the world needs to invest heavily in technology. The International Energy Agency (IEA) calculated in 2011 that as much as $38tn will be needed between now and 2035. That would equate to spending on average about $30mn each week to maintain and develop the world's global energy supply infrastructure.[4] The lion's share of this amount will be spent in upstream oil and gas.

Large E&P companies typically have access to the capital resources required to develop the best and the biggest assets, while the smaller companies play their niche role, commonly with less favourable financing access.[5,6] The new hydrocarbon provinces are increasingly found in ever more hostile and environmentally challenging areas. The growth in future oil supplies must come from deepwater fields offshore Brazil, stranded assets of the African Rift Valley and from environmentally difficult regions such as the Arctic, heavy oil sand provinces and unconventional shale fields. The cost of future oil supplies from the new plays becomes higher as the more challenging resources need to be tapped, and ageing and declining fields need the complex technology of enhanced oil recovery (EOR) to extend their production lifecycle.[7]

Oil companies must continually develop new profitable projects to maintain cash flow and the key issue is to bring down the cost while making the technology more effective in lifting hydrocarbons to the surface. Both large and small quoted companies must develop this new technology, but at the same time, they have a responsibility to their shareholders. For example, pension funds and other investors are dependent on a regular dividend stream. A balance has to be struck between retained earnings for R&D expenditure and shareholder return.

Unfortunately, research in the E&P business risks lagging behind bringing the new resources to the market. Some CEOs of major companies, like Bob Dudley (BP) and Christophe de Margerie (Total), have now openly stated that their data shows global oil production output cannot be raised much further. Meanwhile, Lee Raymond, former CEO of ExxonMobil, believes the R&D required to bring down the cost of tight gas development is not going to happen in the US, but in China.

Some would argue that the major oil operators are still trapped in technology and workflow processes that have worked well for conventional fields. However, they now need to accelerate technological innovation in order to unlock the slim margins to be gained from resources such as tight oil and shale liquids. The E&P clockspeed settings are adjusting too slowly to adapt to the changing realities of the oil and gas industry.[8] If the upstream industry does not succeed in accelerating its innovation rates, both the future output volumes and the retained earnings may be lower. Indeed, retained losses have already become characteristic of many US shale gas operators.

R&D spending

The oil majors have increased their R&D spending between 4% and 18% year on year.[9] Shell, ExxonMobil and Schlumberger are the leading spenders, with over $1bn in 2011. In comparison, BP spent $636mn, Total $776mn and Halliburton $401mn (2011 company reports). This is not nearly enough to mature the technology required to develop resources in extreme environments and make these economically attractive. Even at today's oil prices there is a growing mismatch between cost reductions achieved by effective technology innovation and rising cost due to increased complexity of the new

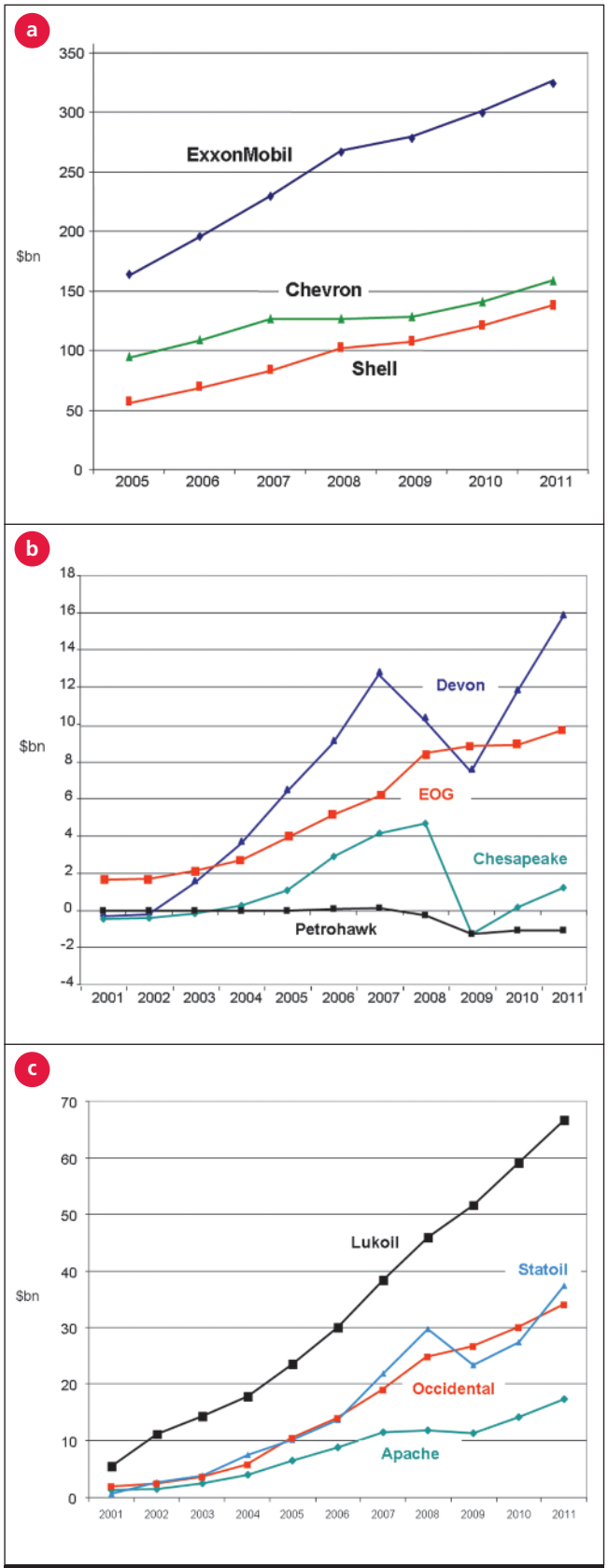

Figure 1: Retained earnings of selected companies – oil majors' cumulative growth over the past seven years (a); US unconventional gas operators (b); conventional oil players (Occidental and Apache), and two privatised NOCs (Lukoil and Statoil) (c)
Source: Alboran analysis and company reports

oil resources. Meanwhile, national oil companies (NOCs) like PetroChina and Petrobras have expanded their R&D budgets. Petrobras spent $846mn on research and technical development in 2010. PetroChina, with over $1.4bn R&D spending, has become the world's leading R&D 'investor'.

Innovative firms have been analysed to show their selective use of five principal financing sources – retained earnings; new share capital; short- and long-term debt; and other income streams, for example, asset sales, grants and tax credits.[10] In the end, retained earnings need to be growing so companies become less dependent on other financing sources. For example, major upstream oil and gas companies typically have an ROCE (return on capital employed) of 20%, and their retained earnings at present are more than enough to maintain investments in new capital expenditure (capex) projects and serve dividend payouts to shareholders (see **Figure 1a**).[11] However, as oil and gas companies move into more challenging oil and gas plays, retained earnings will come under pressure as operational margins are slimmer and capital requirements rise. For example, the newly emerging US shale gas operators have been struggling to make a profit (see **Figure 1b**). Companies like Petrohawk and Chesapeake have not been able to generate any retained earnings, in spite of their business model that distributes no dividends to shareholders. New projects have typically been financed by new share issues and new debt acquisition.[12] Devon and EOG have outperformed their peers (see **Figure 1b**), partly because their portfolios include not only primarily gas, but also significant oil assets which generate higher returns.

Reliance on operational profits to generate retained earnings is by far the most efficient capital source for any stable oil business development, especially when innovation is needed. Debt service places restrictions on R&D budgets, which explains why shale gas companies have been relatively slow in developing the innovation required to keep their shale gas operations profitable. This vicious circle has trapped them into lower retained earnings, insufficient for raising the vigorous R&D efforts needed to improve their operational margins. Arguably, US natural gas prices have declined so rapidly between 2008 and 2012 that no technology innovation rate could possibly keep up and compensate for income loss due to the wellhead price decline rate. Outside the US, the learning opportunities to benefit from better shale gas technology solutions are few. Slow and complex decision-making systems in Europe will continue to delay shale gas development.[13] Meanwhile, Europe's reserves to production ratios (R/P) are 10 years for oil and 15 years for gas – the highest depletion rates of all continents.

Apart from shale oil and gas companies, there is another league of US companies that continues to seek profitable, global opportunities. Examples are the internationalising US independents, like Occidental and Apache. Their retained earnings demonstrate successful growth strategies (see **Figure 1c**). Even faster growth is reported by the internationalising privatised NOCs. Statoil and Lukoil, who collect a steady stream of retained earnings (see **Figure 1c**), are arguably good at innovation. Some of these operators have a regional cost advantage. For example, Lukoil still has access to low wage, high-skilled engineers. Oil and gas business opportunities with higher risk must continue to yield higher returns than relatively risk-free investments.

Looking ahead

As we move forward into a new era in the oil and gas lifecycle, entrepreneurial companies are needed to open new avenues. The internationalising US independents and privatised NOCs are clearly successful business operators. The US shale gas operators are less successful, marred by low gas prices and are

locked into a regional gas market. Opening up LNG export facilities in the US could link US gas prices to other world gas markets.

However, continued reliance on equity-financing and debt-financing sources is risky for any oil company. Rigid repayment or tough re-negotiation conditions are associated with the debt capital. Sliding share prices may adversely impact the debt to equity capital ratio and bank covenants. Any refinancing strategy is affected by the type of assets held by the company and US shale gas operators are suffering from a deadly spiral of debt burden and deteriorating acreage collateral value.

In order not to land in the cash flow trap outlined above, the rate of technology innovation in the upstream oil and gas business must keep pace with the fast clockspeed changes in the industry. That requires increased R&D expenditure before the mismatch grows so large that operational income of the major oil companies starts to decline and precludes a rise in R&D activity. Fortunately, NOCs are already catching up and will play an increasingly larger role in global energy technology innovation. The oil company of the future must fulfill a number of expectations in order to keep the support of the general public, policymakers and the global investor community.

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