

## > Global Energy Industry Outlook

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### INTRODUCTION

In this note I have looked at some of the long-term issues and uncertainties facing the entire energy industry. I have then focused on current trends within the oil and gas E&P industry and suggested how these trends might develop in the context of the long-term outlook, with particular reference to the structure of the E&P industry.

### Long-term Energy Issues: Demand

It makes sense to look first at demand issues, as supply is ultimately geared to meet demand.

The future rate of energy demand growth is a significant unknown. A number of organisations attempt to make long-term demand forecasts. Both the International Energy Agency (IEA) and US Energy Information Administration (EIA) make long-term forecasts of global energy demand for primary fuels (oil; natural gas; coal; nuclear; renewables) and electricity, in the case of the IEA out to 2030 and for the EIA to 2025.

The Organization of the Petroleum Exporting Countries (OPEC) tends to restrict its forecasts to oil demand but is interesting in that it adopts a bottom-up approach, estimating demand not only by region but also by sector (transport; electricity generation etc.).

While helpful, these forecasts are not accurate and in recent years have tended to err on the high side, at least as far as oil is concerned. Yet in the past few months we have seen all of the expert sources consistently underestimate oil demand for the current year so looking ahead to 2030 is clearly a risky business.

Although the rate of oil demand growth is uncertain, in some senses it is not a significant uncertainty as most new production will go towards meeting production decline in existing (and future) fields. Production decline in existing gas fields is less of an issue globally, though it is of major concern in North America.

### ***What are the factors likely to influence long-term demand?***

People create demand so world population growth is a key factor. Potential uncertainties in this sphere include the effects of war and pandemics on global population.

The extent to which people create demand is driven by affluence so another key issue is the rate of world economic growth, particularly in developing countries, since the energy use per capita in OECD countries may be approaching a limit.

Population and economic growth will result in increased demand but there are also a number of factors that will reduce future demand.

## > Global Energy Industry Outlook

Energy efficiencies and savings offer considerable potential. Energy conservation still has some way to go, and will be strongly driven by the cost of energy, but the greatest potential benefits are likely to arise from technological advances in energy conversion, such as electricity generation and a more fuel-efficient internal combustion engine.

The final unknown in the demand picture is the impact of social priorities. Unacceptable levels of atmospheric pollution in major cities may trigger massive shifts to public transportation.

The IEA forecasts that global CO<sub>2</sub> emissions in 2030 will be 70% above year 2000 levels. In the event that runaway global warming seems imminent (or, even worse, occurs) there will also be enormous pressure to reduce anthropogenic greenhouse gas emissions. Resource-rich countries can probably find solutions on the renewables supply side but resource-poor countries will have to focus on demand reduction through increased efficiencies and behavioural changes.

### Long-term Energy Issues: Supply

#### Supply Balance

Fossil fuels are (by definition) a finite resource so a key issue here is the timing and extent of fossil hydrocarbon fuel replacement by true renewables such as wind, wave, tide, solar, biofuels, hydro-electricity and hydrogen, and other long-duration earth resources such as geothermal and nuclear energy.

To some extent the shift to renewables will be driven by necessity as fossil fuel resources deplete and prices rise but pressures from society, as mentioned above, may alter the balance in advance of resource scarcity. It is also clear that technological advances in what is in many instances a relatively young field will drive prices downwards so that renewables become price competitive.

#### Security of Supply

A second major supply issue is security of supply. Fossil fuel supply is subject to considerable potential disruption for a number of reasons. Principal among these are political risk as a result of the skewed geopolitical distribution of oil and gas resources, and the risk of damage (accidental or deliberate) to the facilities and transport infrastructure that are key to delivering a usable product to the end-user (oil and gas pipelines; oil shipping terminals; LNG liquefaction and regasification plants; refineries).

When one considers the volumes of hydrocarbons that are transported nationally and internationally, it is surprising how focused much of that transport is, even when one considers non-static tanker traffic. Huge volumes of oil pass through a relatively small number of geographically-restricted points: Strait of Hormuz; Malacca Strait; Bab al Mandab; Suez and Panama canals; the Bosphorus.

## > Global Energy Industry Outlook

The Russian gas export pipelines to Europe probably represent the most critical single link in terms of global energy supply by pipeline. Pipelines, as shown by events in Iraq, are very difficult to defend against those determined to sabotage them.

As a result of concerns about security, major hydrocarbon suppliers have adopted a number of strategies. Principal among these are: geographical diversity of supply; low-political risk (e.g. OECD) supply; proximity to market (e.g. Venezuela and Trinidad to USA); indigenous.

The security benefit of indigenous supply is also a driver in favour of renewables, especially in those countries with little or no fossil fuel resources.

Proximity to the North American market is also a factor that has acted in favour of the world's two largest sources of non-conventional oil, extra-heavy oil from Venezuela's Orinoco and the Alberta oil sands of Canada.

For electricity supply in the developed world, the principal issues are regulatory. Without a consistent and stable regulatory environment and governmental clarity on emissions trading, the necessary investment will be underfunded.

### **Energy Investment**

The third major factor that will determine the future of supply is investment.

The IEA's estimate for required energy industry investment out to 2030 is for a staggering 16.5 trillion US dollars.

Despite the enormous sum involved, it is

thought that the required capital can be made available.

Nevertheless, investment needs to be adequate and it needs to be timely. Many of the E&P major projects that will be required to meet future needs are in remote or hostile environments or require large up-front investments (oil sands mining; LNG). Long lead times must be anticipated.

Most of the required investment is not in hydrocarbon E&P, however, but in electricity (60% of the total). And while there needs to be substantial investment in developing countries to bring electricity to the billions of people who still do not have access to it, one-third of all energy investment will be in OECD North America and Europe, reflecting the need to replace aging refining and electricity infrastructure. Once again up-front investment and lead times are an issue, with power stations taking up to 15 years to return on investment.

In the E&P sphere, investment needs to be directed where the resources are going to come from—the Middle East and Russia and other transition economies.

The Middle East in particular faces problems of security risk and the issue of how much direct sovereignty to maintain over resource exploitation. In countries where foreign ownership is limited or denied, NOCs are under pressure to deliver earnings to national governments to meet the broader needs of national governments. This is especially true as far as building spare capacity is concerned.

## > Global Energy Industry Outlook

If Middle East investment in low-cost production is restricted for some reason, global investment will have to be even greater which will have the effect of reducing both demand and the OPEC share. This, presumably, is not something that OPEC producers want, with their rapidly growing populations and social costs.

In the case of Russia, the requirements are for a stable legal and fiscal regime and the development of export pipelines and sea terminals. The government will continue to control infrastructure. As a consequence, current indecision about export routes is likely to result in near-term bottlenecks to crude production growth.

In the face of the potential difficulties that may occur in these key areas, interest in non-conventional oil in Canada and Venezuela will continue to grow.

There will be enormous investment in OECD countries (much more than in the Middle East and transition economies) but it will focus on counteracting production decline.

Overall, the precursor for the required investment is stability—stability in upstream legislation and fiscal terms and stability in the downstream regulatory environment.

### Future Hydrocarbon Demand and Supply

On the oil demand side, the driver for the foreseeable future is transport. There is no large-scale alternative to liquid hydrocarbons as a fuel for road and air transport. If oil becomes scarce, what are the alternatives? One likely option is the conversion of natural gas to liquid form (GTL). This has the advantage that the resultant fuel is extremely clean and low in pollutants.

The use of biofuel alternatives (e.g. ethanol from grain) is increasing but at the moment it seems unlikely that bioethanol and biodiesel from temperate climates will provide a large-scale solution because they require substantial agricultural cropland surface and are inefficient in energetic terms, requiring a large energy input to produce. Bioethanol from sugar cane, on the other hand, can be produced at low-cost in countries such as Brazil and India, has a low energy input and reduces GHGs by over 80%.

The forecast increase in demand for transport fuel also highlights another problem, that of crude-product imbalance. While the bulk of increased demand will be for light hydrocarbon products for use in road and air transport, there is a perception that the global crude production mix will become heavier over the next few decades. This implies that significant extra refinery investment will be required if transport demands are to be met.

## > Global Energy Industry Outlook

The causes of oil and gas price volatility are complex but one of the factors involved is the perception of availability. When forecasts of supply or stocks are low, or political events appear to threaten supply, prices rise. To avoid this, there has to be spare capacity, both in production and in stocks. “Just-in-time” does not work as an oil industry business strategy. The IEA can oblige countries to maintain stocks but nobody can oblige IOCs to invest in unused production capacity (and their shareholders would not understand it). It therefore remains in the hands of governments such as Saudi Arabia and the UAE to maintain spare supply capacity. The world relies on governments and NOCs to take a long-term view!

A growing trend in production over the past few years, as a result of improved technology, has been increasing well production decline rates. Companies are opting to deplete fields rapidly as it is more capital efficient to do this.

New oil discoveries are replacing little more than half of current production but improved recovery from older fields means that reserve additions from all sources are still exceeding production. The situation over the past decade has been better for gas in that gas discovery has slightly exceeded gas production.

The stock of remaining undeveloped discoveries is continually shrinking, however, so the opportunity to develop “stranded” discoveries is diminishing.

Uncertainty over the size of remaining resources and real production capacity, especially in key producing countries, remains a matter of great concern and an area in which better information would be most welcome.

### Access to Production

For oil, much of the required investment will have to be in Middle East OPEC countries. Over the period, more capital will have to be invested in reducing field declines and improving recovery from “difficult” reservoirs, technologies at which IOCs have considerable skills. But will they be invited to participate? And if they are, will their shareholders wish to take the risk? The evidence from investment in Russia suggests that shareholders can be persuaded to accept increased risk for increased rewards.

So the issue becomes one of the terms on which investment is sought in those countries that prohibit foreign ownership of assets. To avoid price volatility, investment must be secure, sustained and timely.

In the case of Iran, the only major Middle East producer to involve IOCs, the current buyback contract system has distinct disadvantages. From the IOC's point of view, they cannot book reserves and find it difficult to attain the percentage return on investment that they seek. Perhaps more important in the long term, however, is the front-end loading of the benefits of the agreements which essentially involve construction and shake-down and then handover. This provides no incentive to

## > Global Energy Industry Outlook

plan for the introduction of technology aimed at maximizing recovery over the longer term. In other words the interests of the IOCs and their investors are not aligned with those of the country or the world as a whole.

It makes sense for OPEC countries to attract capital that would otherwise be invested in non-OPEC production but the terms will have to be adapted to permit and encourage a long-term commitment under relatively low-risk conditions.

If the capital is not invested in countries such as Saudi Arabia, Kuwait, Iran and Iraq, one can see it being spent on higher-cost oil elsewhere which, as was pointed out above, will increase oil prices while reducing both demand and the OPEC share.

### Volatility

Apart from the impact of unpredictable events (war; terrorism; political unrest; weather-related incidents; accidents), the most likely source of production-related oil price volatility is likely to occur if OPEC is unable to control the supply of oil to the market.

The inherent sources of such stresses are already present in the return of Iraqi oil to the market, upward pressure on quotas from the African OPEC members, and the desire of importers to increase security of supply by diversifying supply sources away from the Middle East towards Africa, Russia and the Western hemisphere, thereby putting downward pressure on OPEC quotas.

A notable feature of price sensitivity is its asymmetry. Low prices are a strong negative prompting rapid reaction in terms of reductions in exploration and development expenditure but there is a less rapid response to high prices. There is also a marked difference between the response in North America and internationally, with the response to price change (positive or negative) being more swift and more extreme in North America than in the international sphere.

### Exploration

The wildcat drilling data clearly show a decline in exploration effort on the part of the industry over the decade 1993-2002. The cost data show no significant pick-up in 2003 and for those companies that have reported 2004 expenditure plans in sufficient detail to separate out exploration expenditure from development expenditure, there is no sign of an upturn planned in 2004 either.

### *Why has this downturn occurred?*

Let's go back to industry basics. Petroleum E&P is a commodity industry and in commodity industries profitability is traditionally low except at times of supply scarcity or where a near monopoly exists.

Neither situation applies at the moment. The industry is highly competitive and supply scarcity only occurs as a result of market manipulation by OPEC.

## > Global Energy Industry Outlook

In addition, growth is constrained by increase in global demand, which is forecast to increase at average rates of 1.6% and 2.4% for oil and gas respectively over the next two decades (and even that may be optimistic if the past decade is any guide: 1.2% for oil and 2.2% for gas).

So the opportunities for increased profitability through growth are strictly limited for major producers unless they can capture increased market share. There are really only two vehicles for this—acquisition or (in the case of oil) force a reduction in OPEC market share by increasing non-OPEC production.

While double-digit production growth may be attainable for small companies, investors have now realised that, for the majors, long-term organic production growth values of 5% per annum or more are going to be difficult to sustain.

Everybody cannot capture market share. Investors and companies have therefore turned to return on investment as the measure of company success.

This has led companies to take a much more critical look at the profitability of individual projects, prior to taking a decision to invest further. This has had its benefits. Assets deemed too capital or labour intensive by major companies are passing down the chain to smaller companies who can work them more intensively, thereby increasing returns in both value and production / reserves.

But the down side is that investors are rewarding companies that use excess cash to reduce debt, increase dividends, buy back stock and acquire production.

Expenditure on wildcat exploration clearly does not figure favourably in this scenario.

### ***So what is the outlook for the future?***

BP's Lord Browne, in his financial presentation statement on 10th February 2004, commented that is now reasonable to use \$20/bbl as a base case balancing point for financial planning rather than the former \$16/bbl.

This is an implicit recognition of a future of sustained higher oil and gas prices.

This in turn places a much higher value on producing and developable assets, making acquisition expensive, but subject to much more risk in the event of an unforeseen price downturn. With continuing need for companies to replace production with new reserves (another investor demand), the time may come in the not-too-distant future when a return to exploration becomes inevitable.

Another factor in the downturn in exploration by major companies is lack of access to large prospects. Little is foreseen in the way of "new geography" with only post-sanctions Libya, Iraq, deepwater Mexico and Kuwait registering on the radar.

## > Global Energy Industry Outlook

### Companies

There is one issue that is applicable to all types of company, namely the conflicting demand on cash between investment and shareholders.

### NOCs

The major uncertainty (for large producers only) is demand. Price volatility is also an issue.

The major problem faced by NOCs is the competing demand for cash between investment and their shareholder (government). This is a particular issue when it comes to the provision of spare capacity.

The role of the international NOCs in exploration/development is also worth highlighting. These companies (sometimes called the semi-NOCs, in part because a number of them are not 100% government owned) have distinctly different aims from IOCs. Because they have few real private investors to satisfy and their international expansion policies are being underwritten to secure new supply sources, they can afford to accept lower returns on investment and look longer term in their choice of investment. This enables them to underbid IOCs in a number of situations.

### Major IOCs

One problem faced by the majors is that they have set the rate-of-return hurdle very high, so only the better quality opportunities are being pursued, in a trade-off against growth.

One area where the super-majors score is in security of investment (e.g. Venezuela; Nigeria; Russia). They can afford to be involved in several high-risk, high-opportunity areas while maintaining a substantial investment in low-risk, low-opportunity areas such as the OECD, thereby pooling the risk.

Technology is another area in which the majors have excelled, from opening up access to the deep oceans to delivery of large-scale non-conventional oil, LNG and GTL projects at ever-decreasing unit production costs.

The trend is therefore towards the growth of gas businesses and non-conventional oil and gas production, while the potential for companies large enough to undertake large projects (e.g. LNG) remains enormous.

***There are some potential obstacles to be overcome, however.***

Many IOCs are now using Return on Average Capital Employed (ROACE) as a performance metric. A danger of this approach, as with the attitude to exploration outlined above, is that it encourages short termism. Many of the projects that will be required to meet the world's energy needs are capital intensive with the bulk of costs being incurred up front when there is little or no initial return. Thus while many conventional projects now focus on early production to get initial cash flow, an oil sands mining project or LNG liquefaction/regas project brings no cash flow until the project is essentially complete.

## > Global Energy Industry Outlook

Companies and investors may have to learn to accept lower ROACE targets in order to finance long-term projects with growth potential.

Part of the reluctance of the major IOCs to explore is also due to lack of access to the areas where the best prospects remain.

Since it appears that the NOCs have access to many of the best prospects and can also afford to look to the long term, will there be a shift in the role of the major IOCs to becoming providers of finance and technology in exchange for assured production?

### Independent IOCs

The strategies of the NOCs and major IOCs outlined above will have the effect of squeezing the small to medium IOCs.

#### **Their ultimate role may be as niche regional players:**

- exploring in areas where prospect size is too small to be of interest to the majors;
- leveraging their specific technical expertise;
- exploiting assets and opportunities rejected by major companies as being inconsequential (e.g. UK North Sea);
- capitalising on their speed of response and flexibility.

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