Skeet, Ian (Ed.)

Periodical Part

Oxford Energy Forum, Issue 65, June 2006

Oxford Energy Forum: A Quarterly Journal for Debating Energy Issues and Policies

Provided in Cooperation with:
The Oxford Institute for Energy Studies, Oxford

Suggested Citation: Skeet, Ian (Ed.) (2006) : Oxford Energy Forum, Issue 65, June 2006, Oxford Energy Forum: A Quarterly Journal for Debating Energy Issues and Policies, ISSN 0959-7727, The Oxford Institute for Energy Studies, Oxford, Iss. 65

Oxford ENERGY FORUM

A QUARTERLY JOURNAL FOR DEBATING ENERGY ISSUES AND POLICIES

Issue 65 May 2006

For your early summer reading we start with a look at the International Oil Companies (IOCs), which, not for the first time, find themselves in the spotlight. In the old days it was taken for granted that the objective was to get as much upstream as you could and have an integrated system through which the crude would pass. These days upstream resources are hard to come by. Project Management has become a vital ingredient of their activity, but suitable personnel seem as elusive as upstream oil. Into all this come the financial analysts and investors demanding more cash more frequently and the environmentalists demanding all manner of energy provided it's not oil. So, where will the IOCs end up?

If you have had doubts that the IOCs will manage to survive for much longer, Richard Gordon's article should encourage you. He describes the four areas in which they have what is potentially a clear advantage – the re-emergent attraction of integration, the role of natural gas, the growth of industrial scale investment projects and their access to technology. Indeed, is IOC, perhaps, now a misnomer and should we think of them as International Industrial Energy Companies, IIECs? At any rate, there is no need for despondency on their behalf; the opportunities are there, even if the challenges prove too demanding for some of the existing companies.

Chris Ross and Lane Sloan concentrate more on the leadership qualities needed to steer the IOCs through what are likely to be the stormy times ahead. As IOC access to oil reduces, the external pressures of society on their activities will increase, while internal pressures will demand new sources of profit from different types of investment. To succeed under these conditions will require, above all, a leader, managers and staff who understand how to operate in an environment that is continually developing new challenges and demands.

Ged Davis looks first at the recent decline of the IOCs in the context of oil reserves. He notes their current interest in mega-projects but wonders if these will produce an adequate return on capital and what effect the challenges from, for instance, the environment, the rise of India and China or resource

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nationalism will have on the ability of IOCs to carry out such projects. His tentative conclusion is that the way in which the global system develops is likely to determine what happens to the IOCs. Two possible futures are a relatively 'open' world in which we would see IOCs developing in a recognisably international manner from what they are now, or a world shaped by nationalisms in which the IOCs themselves become part of different national interests.

We turn from the future of the IOCs to the current debate on gas prices in the UK, and are indebted to Philip Wright for giving us an overview of the analysis put forward in his recent book published by OUP for the OIES Gas Programme. His argument can be distilled into the simple proposition that the current high price of gas, although assisted by local infrastructure problems and depletion of dry gas fields, is largely the result of liberalisation. As he says, the gas chain has been opened up to market intermediation, and he shows what has been the result for gas prices. High prices in the UK, in other words, have had little or nothing to do with the absence of liberalisation in the rest of Europe, as has been claimed so widely.

Another of our articles deals with problems faced by the construction industry at this time when energy projects, from refining to gas to LNG, are demanding more expertise and management than ever before in order to fill perceived infrastructural gaps. The construction industry is as hard pressed as the energy companies themselves, and is faced not only with cost inflation but also scheduling, or time, inflation. Malcolm Harrison shows us how the contracting companies are dealing with this situation. Probably the most effective initiative so far has been to move the construction process to where labour is available, which permits offshore construction to be decoupled from work on the site itself. Long term, however, a larger stream of engineering students is required to refill the ranks of those lost during years of reduced activity.

Hadi Hallouche covers a different angle on the gas market, that of the Gas Exporting Countries Forum (GECF). It has been seen by some people as an incipient second OPEC but, as he explains, its interests, even if they develop into an agreed policy (which hasn't happened yet), are unlikely to be a threat to gas buyers. Meantime, the organisation is still feeling its way.

Since this is the last Forum being supervised by its current editor, you will also find in this issue a few comments from him on some aspects of the energy scene.

Personal Commentary in this issue is by Derek Riley, who takes a look at the expectation for Chinese economic growth and oil consumption over the next five years. Specifically, he questions the IEA assumptions for energy growth, particularly as they relate to OECD figures for economic growth, and finds little comfort for oil prices in the resulting forecast for Chinese oil demand and imports.

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The International Oil Companies

Richard Gordon considers the prospects and challenges ahead

This essay briefly discusses the future of the international oil companies (IOCs) with the focus on four central prospects or challenges that they must address in the coming decade. The IOCs are an extraordinarily diverse group – far too diverse to allow generalisations that will apply equally to every company. As such, this discussion will be limited to the publicly traded, globally diversified oil and gas companies – a category that is customarily reserved for the likes of ExxonMobil, Shell, Chevron, BP, Total, ConocoPhillips and ENI.

There are four industry-wide (or macro level) processes at work that are likely to serve as significant sources of future opportunity for the IOCs to not only survive but to prosper. To be sure, the IOCs face many challenges. In the extreme case, it is believed that they are an endangered species. Others suggest that they must radically evolve to survive. It is beyond doubt that there are serious challenges facing the IOCs. Cut-throat competition is and always has been the norm in the industry and, in view of recent high oil and natural gas prices, competition is bound to intensify. How companies respond to higher prices will have a great deal to do with their long-term performance.

The macro forces at work today are: re-emergent integration and its uses as a source of competitive advantage, the continuing development of the international trade in natural gas, the growing role of the industrial oil and gas economy in future energy supply, and the progressive role that technology and its application in high risk environments plays to redefine the resource base.

Re-Emergent Integration

After an extended period of retreat, arguments for an integrated investment strategy have re-emerged in recent years. The integrated strategy includes the traditional combination of E&P with refining and marketing as a means of capturing higher margins for crude production. Upgraders for Canadian oil sand bitumen production or for Venezuelan Orinoco projects and the risk that imbalances in heavy oil supply and upgrading capacity can cause wide swings in margins illustrate the continuing value of specific forms of integrated strategy. However, the logic of integrated asset strategies reflects two key other functions: integration as a profit centre in its own right and as an enabler of upstream resource development.

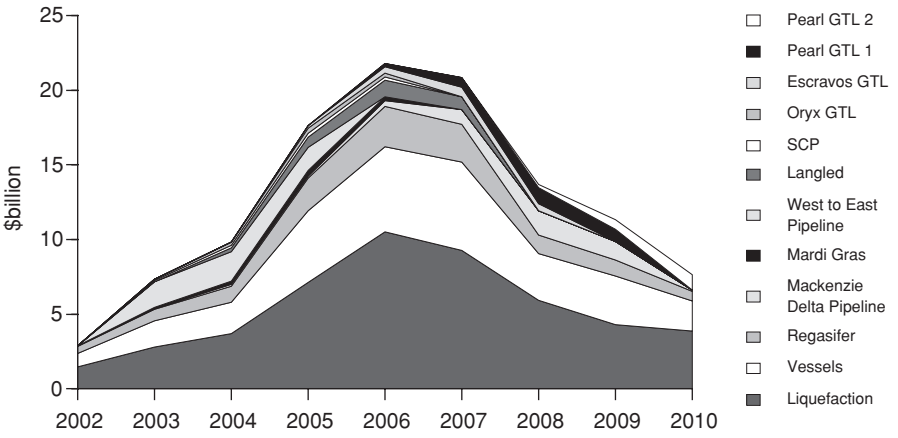
Integrated assets can serve a key role as a profit centre through the revenues earned in processing or transporting other companies' oil or gas output or not having to pay a third party to handle one's own output. These revenues are enhanced when the provision of services to third parties enables economies of scale in infrastructure, results in lower unit costs for the investing company's production and ultimately increases recoverable reserves.

"After an extended period of retreat, arguments for an integrated investment strategy have re-emerged in recent years."

An important analytic problem will become clear as the role of integrated investments in major world class resource projects rises – the line between upstream and downstream is blurring and the composition of a company's earnings may change substantially. Conventional measures of upstream earnings and the associated performance metrics used widely in the financial community are diminishing in value and can be misleading. The problem is that these conventional measures treat the upstream as a divisible business segment in an increasingly inter-related investment portfolio.

The second driving factor is the strategic role of integration as a means to commercialise resources. This

Figure 1: Investment in Selected Major Infrastructure and Integrated Asset Projects



Source: *Gordon Energy Solutions estimates*

is a key driver behind the massive infrastructure projects worldwide, liquefied natural gas (LNG), heavy oil and gas-to-liquids (GTL). Key examples are infrastructure projects in the Caspian (CPC, BTC, SCP), China (West to East Gas Pipeline and LNG terminals), prospective pipelines from East Siberia to Asia, the Bolivia/Brazil gas pipeline, the Mardi Gras pipeline system in the deepwater Gulf of Mexico, LNG from the Barents Sea, the Canadian Arctic and Alaskan North Slope gas projects. Each of these examples illustrates both the magnitude of capital investments required to undertake these projects and the potentially massive volumes of resources that can be accessed only through these investments.

"the line between upstream and downstream is blurring"

Figure 1 shows a projection of infrastructure and integrated asset capital spending related to selected gas megaprojects. These projects are intended to show the comparative magnitude of the integrated asset investment programme. Consider, for example, that Shell's worldwide upstream capital and exploration spending planned for 2006 is $15 billion and ExxonMobil's is approximately $12.5 billion.

Integrated strategies offer the IOCs substantial long-term opportunities for at least three key reasons. First, a substantial portion of the IOCs competitors exclude themselves from these large integrated projects either because they choose to be E&P companies only or because they lack the capital and human resources to compete. Second, a substantial number of potential competitors lack the underlying depth in their asset portfolios to enable them to be major players in these large projects. Third, in more than a few cases the IOCs are the holders of substantial legacy resources that were discovered many years previously but remain unexploited, i.e., the IOC internalises the full economic return associated with the integrated project.

The International Gas Business

A central question confronting the large IOCs is how can they achieve sustainable earnings growth in a slow growing oil market with production from a high decline rate resource? (This same challenge is now haunting the doorsteps of many national oil companies (NOCs) and goes a long way towards explaining why many of these NOCs are looking outside their host countries for growth opportunities.)

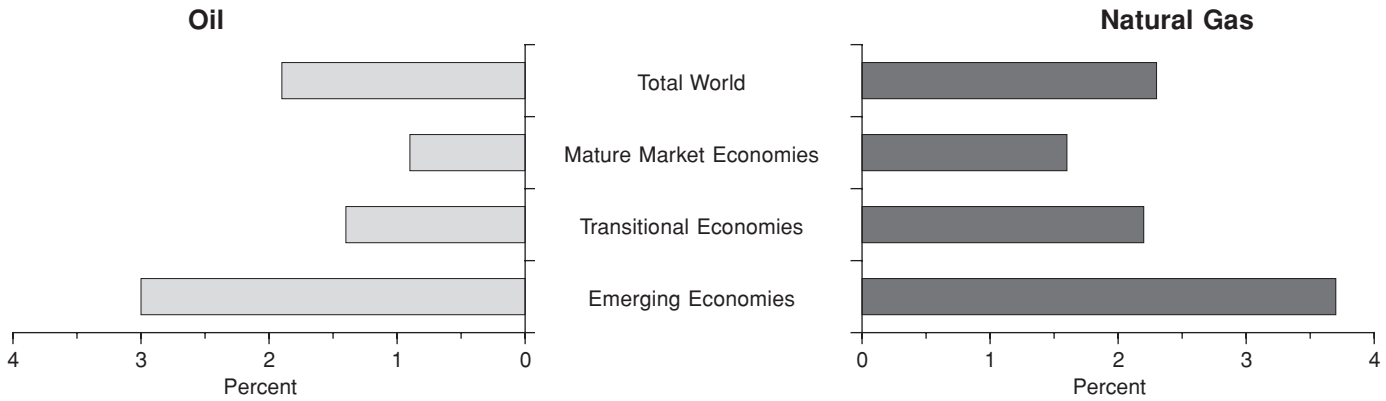
By definition, the upstream contribution to earnings per share (EPS) will equal the product of boe output per share and earnings per boe produced. The rate of growth of upstream EPS equals the sum of the percentage growth rate of output per share and earnings per boe. These simple identities do much to explain the pendulum-like swings of consensus in IOCs' strategy between cost cutting and production growth since 1986.

Figure 2 illustrates the problem of attaining significant growth in the oil segment and the perceived opportunity presenting itself in natural gas. The projected rate of growth in oil consumption is less than 2 percent per year worldwide and less than 1 percent in the mature economies where a substantial portion of refining and marketing assets is located. This low rate of growth of worldwide consumption caps the growth rate in total oil production that can be achieved without driving oil prices down.

"the opportunity is to shift one's growth focus from oil to natural gas"

The opportunity illustrated in Figure 2 is that natural gas consumption is projected to grow more rapidly than oil in every market. In short, the opportunity is to shift one's growth focus from oil to natural gas – a strategy recently announced by Chevron and one that ExxonMobil has been aggressively pursuing in Qatar since the two companies merged. The result is also a more stable production profile than offered by a conventional oil

Figure 2: Projected Average Annual Rate of Growth in Oil and Natural Gas Consumption by Region, 2002–2005



Source: *US Department of Energy 2005 International Energy Outlook Reference Case*

focus. This stability reduces near-term reserve additions required to increase output at any targeted rate and, thereby, relieves pressures on the new ventures programmes. Not shown in Figure 2 is the prospect of declining or stagnant natural gas production in the key mature economy markets of North America and Europe which implies a market need for gas imports that will be growing more rapidly than the consumption growth outlook suggests.

The international component of the world gas industry is rapidly growing. This requires the construction of an extensive, integrated infrastructure. The trend is likely to cause a change in the balance of power within the group of producing countries and between oil and gas resources. Consider, for example, Qatar's goal to produce 77 mmtpa of LNG for export by 2012 – an energy equivalent of 1.9 million barrels per day (not to mention the substantial liquids output associated with this gas production). Nigerian LNG capacity from its first five trains is 17 mmtpa (roughly 2.5 bcf/d gas inlet and energy equivalent output of 378 mb/d) with the 4 mmtpa Train 6 to come in 2007 and new liquefaction plants in various stages.

"what is the planned long-term role of North America in the company's strategy and profits?"

Access to the key gas-consuming markets in Asia, the United States and Europe becomes a potentially important competitive advantage that is dependent on access to regasification plant capacity in these markets just as much as it is linked to resource ownership. A comparison of major international gas projects outside the Middle East suggests a strong advantage held by the IOCs due to their legacy resources. Notable examples include the NW Shelf and Gorgon in Australia, associated gas supplies to Nigerian LNG being drawn from old legacy assets in the Delta, and Angola LNG which will draw its feedstock from associated gas produced from deepwater discoveries.

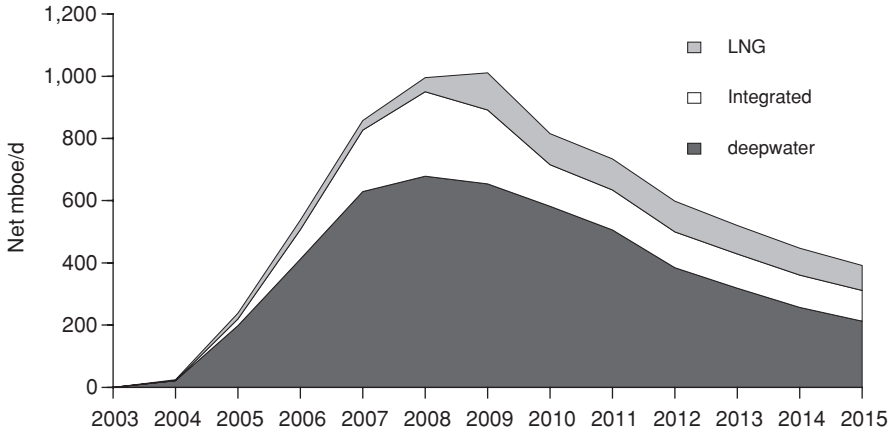
For a number of years the consensus among the IOCs has clearly been that North American upstream assets are, primarily, a source of cash flow to be reinvested in other regions of the world where growth prospects are more robust. This general pattern of withdrawal (especially from onshore North American plays) extended into the ranks of the second tier IOCs and created an opportunity for smaller E&P companies to acquire producing assets from the IOCs. Recent conditions in the North American natural gas market have triggered a major strategic question for IOCs. Specifically, what is the planned long-term role of North America in the company's strategy and profits? Is North America's role in future IOC profits that of a market outlet for natural gas resources located elsewhere in the world or is North America also a major long-term source of supply of natural gas? A reversal in previous plans to gradually reduce or exit North American E&P will generate substantial pressures on the IOCs to undertake major acquisitions. Despite its potential North Slope and Mackenzie Delta gas projects, ConocoPhillips' North American position outside the Arctic was not an apparent growth sector for the firm. The acquisition of Burlington Resources suggests that a decision has been made in favour of building the supply capability of North American operations. Alternatively, some IOCs may opt to substantially increase their new venture programme efforts in the region. Shell's recent licensing activity in the USA and Canada suggests that the company has also re-considered its position on North America's future.

The Industrial Petroleum Economy

Conventional exploration and production operations reflect their mining or extractive industries character. The extractive petroleum economy has unique characteristics including the recurring 'boom and bust' cycle. Standing in sharp contrast to the conventional extractive E&P industry and business strategy is an emerging industrial petroleum economy. A number of key areas of IOC operations offer examples of the industrial economy:

- oil sand ventures in Canada as well as the earlier Orinoco projects in Venezuela,
- the proliferation of major LNG ventures among the group in Qatar, Trinidad, West Africa, and Australasia,
- GTL projects and
- enhanced oil recovery (EOR) projects.

Figure 3: BP, Estimated Net Boe Output from Non-Conventional Identifiable New Projects Excluding Wildcards, $55 WTI Mid-Cycle Price Case



Source: *Gordon Energy Solutions estimates*

Industrial energy projects ameliorate the problem of declining legacy assets, offset the high decline rates typically experienced in conventional E&P investments, and provide constant or nearly constant volumes over long periods of time. The resulting more stable base IOC production provides a potential platform for predictable growth. The potential for efficiency improvements over time is significant, due to de-bottlenecking investments, add-on trains, and an increased likelihood that technological improvements will increase profitability in the future.

Industrial energy projects play to the strengths of the IOCs. They are often brought on-line in phases over time. The project class is typically very large with evidence of very considerable economies of scale and size. The class of ventures is also very capital intensive and usually involves integrated manufacturing processes. All of these characteristics of the industrial petroleum project imply that corporate asset depth, a long time horizon, and engineering and management experience play critical roles.

Technology and the Expanding Frontier Resource Base

At any time, the frontier in the energy industry, i.e., the margin at which commercial viability just barely exists is a diverse and fluid mix of risks and opportunities. Technology expands the resources available to the IOCs by pushing the margin or frontier back, thereby adding resources in areas previously not available such as the deep and ultra-deepwater environment or by increasing the recovery factor on known oil and gas reserves.

"Industrial energy projects play to the strengths of the IOCs"

The rising role of deepwater and ultra deepwater discoveries is well known and BP offers a stunning example of the degree to which progress in this arena will add future new source output (see Figure 3).

But deepwater is really only one of the more highly visible examples of the technology effect. Many other examples exist. For example, frontier gas resources such as coal bed methane and tight gas are rapidly growing in importance in the North American business and, in the process, redefining strategic interests not just of independents but also of the IOCs. ExxonMobil's plan to use multi-zone stimulation technology to fracture large numbers of tight gas zones in Colorado's Piceance Basin or deep gas exploration in the shallow water Gulf of Mexico are two other examples. The Long Lake oil sand project in Alberta combines integrated upgrading investments with a design technique involving the conversion of typically discarded bitumen bottoms into fuel for the steam assisted gravity drainage (SAGD) bitumen production phase.

Each of the factors noted in this essay offers long-term opportunities that match well with the inherent strengths of the IOCs. The potential strategic impact of these forces in favour of the IOCs is greatly enhanced by the fact that the four factors are not independent but, rather, are inter-related and can mutually reinforce each other.

Chris Ross and Lane Sloan propose a navigation aid for energy leaders

Conventional oil is in the mature stage of its life cycle. Over the past two centuries, developed countries have moved from use of primitive fuels, through coal, onto oil and now towards natural gas as the most important energy form driving their economies. And let there be no mistake, the availability of energy at affordable prices enables economic growth and economic growth drives energy demand. Over the past century, the energy industry has passed from the dominance of the Standard Oil Trust in the 1890s, through the alleged cartel of the Seven Sisters major oil companies during mid twentieth century, to the real, but only partially effective cartel of OPEC. As the conventional oil industry passes through maturity, we should expect a competitive shake-out.

"Public projections are misleading in suggesting that supply and demand will balance at moderate price levels"

The competitive landscape of global oil is changing fast. Over time, national oil companies such as BP and Total, founded in the developed consuming countries to secure international supplies, have been privatised and are now indistinguishable from other international oil companies (IOCs). National oil companies of producing countries (NOCs) are expanding into the downstream refining and marketing sectors challenging the IOCs' core value proposition of access to markets. More than that, some NOCs have transformed into a new breed of internationalising national oil companies (INOCs) in direct competition to the IOCs.

It has been common to view the IOCs as the primary suppliers of oil worldwide. It is time to recognise that the eighteen international oil companies in the top 50 global oil companies control less than one-quarter of global oil and gas production, own about 30 percent of worldwide refining, and account for only about 6 percent of global oil and gas reserves. Therefore, they have little influence, let alone control, over global oil prices. With 70 percent of conventional oil reserves controlled by national oil companies, consuming countries need to change their mental models of the international oil market, which tend to be frozen in the paradigms of the 1960s, or even the 1890s. On their part, international oil companies can help by explaining the new reality more clearly to stakeholders in consuming countries.

"External pressures on the energy industry are strengthening"

Pricing economics from recent oil supply and demand trends, if continued, will bring on a new energy supply mix and consumption patterns sooner than the oil industry is anticipating. Public projections are misleading in suggesting that supply and demand will balance at moderate price levels. It is not in the economic interest of major producing countries to increase production by the large increments needed to match demand trends. Demand, and therefore energy price pacesetting, is shifting from the United States to the developing countries, particularly China and India. This will create new competitive alliances.

How are the major IOCs responding to these new realities? Many energy executives focus their public statements on the difficulty of gaining access to conventional oil resources in traditional places. The implication is that they wish to continue to pursue the same sort of opportunities in the same ways as they did in the past. It is the authors' belief that this approach will encounter strong head winds and will not lead to success. The market forces impacting major IOCs favour new value propositions for accessing conventional resources; invite the transformation of stranded gas and solids to liquid fuels and the adaptation of refining systems to accommodate them; and support extending their product mix to cover a full range of transportation and power products and rapid deployment of emerging technologies.

External pressures on the energy industry are strengthening. As one CEO told us: 'The industry has always been at the intersection of economics, technology and geopolitics – always. I don't see that changing.' Geo-politics will continue to create challenges for energy companies. The apparent 1990s trend toward opening of closed markets and resources appears to have at least been suspended. Historians are talking more of the 'Clash of Civilizations' than the 'End of History'. The expansion of INOCs has a mercantilist flavour, which hopefully will not lead to world wars as in the past.

At the same time, societal pressures continue to mount in developed countries where expectations are high not only for what energy companies do, but also for how they do it. Stakeholders demand energy supplies at affordable prices with no environmental impact. They call for companies to make bottom-line reports for social responsibility and environmental protection, and not just financial success. They require sensitive treatment of local communities and assurances that government oil revenues are used wisely. They will not tolerate environmental or safety lapses, and will demand greenhouse gas caps. Energy is not purchased for pleasure. It is a necessity, and volatile high prices and threats to supply are deeply resented by consumers. This resentment flows into public policy constraining energy companies' effective and efficient 'licence to operate'. Collectively, the industry has a problem with its relations to broader society, which have been handled poorly and must urgently be improved.

So there is the challenge for energy company leaders. Tight energy supplies provide tremendous opportunities for growth as well as for profits. Intense competition, however, is bidding up the cost of access, services and materials especially for conventional resources in traditional places. IOCs must rise to the challenge by investing in unconventional resources and in difficult places to become growth stocks again, as their predecessors did in the 1970s. This is not a time to be timorous, or wring hands over difficult access, or derive the wrong lessons from the downturn of the 1980s. The real lesson from prior cycles is that energy company stocks performed better than the market in the 1970s and 1980s because the industry leaders responded to the cycle. They delivered both growth and returns and created lasting value by deploying technology to find new resources and convert them into saleable products. Yes, it is a cyclical industry, but this is the exciting growth stage, and fortune favours the brave.

"IOCs must rise to the challenge by investing in unconventional resources and in difficult places"

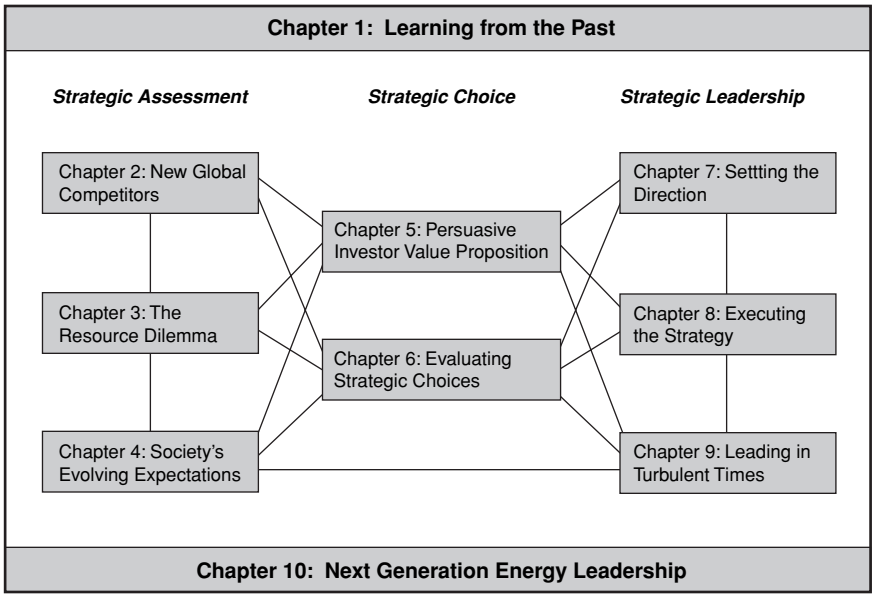
Our interviews with energy company leaders confirmed that many of them have understood the challenge and are facing up to it. Some companies such as Suncor, EnCana, British Gas and Chesapeake have chosen to build persuasive investor value propositions around stranded or difficult resources, and their leaders are confident in their prospects for future growth and returns. They are working to continuously improve their business models, and hone the core competencies that differentiate them from competitors. They are also conscious of their obligation to the communities affected by their operations.

The supermajors are rather like the super-tankers they charter in that it takes a while between moving the

rudder and altering the direction of the ship. However, they are adjusting their value propositions to resource owners. BP and ConocoPhillips, for example, have recognised that the way to participate in Russian resources is through a genuinely Russian company. This model can be extended into other geographies. The supermajors too are increasing their exposure to difficult resources, as demonstrated by Total's substantial and to some expensive investment in the Deer Creek oil sands opportunity. Total is clear sighted that the premium they paid is small in the context of a massive and long-lived resource play.

The lessons we are learning from our interviews are that the successful energy companies of the future will need to reset their direction carefully, effectively execute their strategies, and demonstrate leadership that responds to the challenges ahead. Figure 1 shows the architecture of energy leadership in the future proposed in our forthcoming book.

Figure 1: The Architecture of Energy Leadership



"They will need to redefine the boundaries of their business to open up opportunities for profitable growth"

Successful IOCs will need to choose a course that is downwind of the major trends and adjust the course as the winds shift and squalls flare up. They will need to redefine the boundaries of their business to open up opportunities for profitable growth, and reshape their portfolios of businesses so that more of them are helped by the trade winds and fewer are forced to tack. The current environment favours unconventional and technologically difficult resources; integrated value chains; and organic over inorganic growth, though acquisitions that are truly strategic can still create value, less from synergies and more from portfolio strengthening. EnCana and Statoil, ConocoPhillips and Burlington Resources believe they have found genuine win-win solutions that add value to both parties. Value needs to be seen in the context of a portfolio and in the context of optionality, and is different for different players with different strategies and shareholder value propositions. Finally, in setting direction, the best companies are strongly focused on developing and continuously improving their core competencies.

In executing strategies, IOCs will be obliged to secure commitment from their employees and shareholders. They will need a paradigm shift in their value propositions to governments, national oil companies and citizens if they wish to gain access to resources and markets – rethinking their approach to partnering. They will have to further improve their ability to make good choices by inverting their capital allocation process from screening projects out to screening projects in. They will further need to reappraise their approaches to outsourcing and technology development. In many cases they will need to realign their organisations with the true value drivers of their different business lines and move away from a functional emphasis on efficiency rather than effectiveness. Finally, they must work harder at going beyond merely securing a licence to operate to become an integral part of the solution in satisfying the needs of the communities in which they do business.

Leaders in the new energy business environment must convey a sense of purpose to their organisations, imbuing a sense of destiny with a positive attitude to assure alignment, and an ability to stay the course during setbacks. They must continue to proactively shape culture and values. They must create a context in which good decisions are made naturally because the leadership team trusts each other, decision rights are understood and governance is supportive. All the leaders we spoke to are committed to maintaining high performance through well designed accountability systems, proper performance management and long-term and short-term incentive plans. Finally, an essential part of leadership today is creating an attractive place to work, particularly recognising the industry will lose a large proportion of its experienced staff in the next decade.

One of our interviewees started our meeting by saying:

> Let me tell you what. I hope in this book you don't focus just on strategy. Because I think what makes a company successful is the culture and the people. And if you have the culture right and you put

> your employees first, then they're going to take care of the shareholders, and they are going to be loyal to the company, and they are going to be loyal to their job, and they are going to take care of the community. And to me, that's the basis and the foundation for the success of the company.

The authors agree people are the fundamental core of a firm's success. But our interviewee personally excelled at getting his firm pointed in the right direction based on an insightful reading of the trends, acquiring, developing and organising people to execute strategies effectively and providing the leadership that caused that to happen. And he provided his investors with a 650 percent return from end 2000 to end 2005.

"They will have to further improve their ability to make good choices by inverting their capital allocation process from screening projects out to screening projects in."

Over the same period, the supermajors provided 150–200 percent returns to their investors: better than the DJI or the S&P 500, but mediocre compared to the energy stars. We believe this is because they are failing to provide growth at a time when prices signal the need for more energy supplies and investors want to put more money to work in the energy sector.

One of our supermajor leaders asserted:

> When you look at these very asset-heavy companies there is a tendency to see the assets as the essential element of the company. I don't think that's the case at all. I think it is the human resource, and the ability of the human resource to be imaginative and to keep rethinking the model to adapt to a changing world. I don't know if there will still be five supermajors in ten years time, but I do think that if there are, the things they will be doing will surprise us. We're going to have to keep reinventing the model.

The IOCs whose leaders do not lead and inspire reinvention will join Gulf, Getty, Amoco, Arco, Mobil, Texaco, Unocal, Fina and Elf with legacies only in history books.

Ged Davis looks at the future of IOCs

By any measure the integrated oil companies, renamed the international oil companies (IOCs) following the first oil crisis, have had a remarkably successful twentieth century. Can this be maintained into the twenty-first?

If we look back at the largest companies nearly 100 years ago, two of them were large oil companies: ExxonMobil and Royal Dutch Shell (see Table 1). The secret of their success is familiar to business leaders today. For example, the largest industrial firm in the world then, US Steel (named USX today), had achieved leadership through a combination of success in the marketplace and strategic acquisitions.

If we look at the rankings in 2001, General Electric, with ExxonMobil and Shell, are the three companies to have remained in the top dozen throughout the century (see Table 2). They have also been joined by British Petroleum, not yet founded in 1912. Being in the right industry clearly helps, and the oil business was a very good one to be in as the twentieth century dawned, for ahead lay the rise of oil, at the expense of coal, and the surge in demand for transportation fuels – ExxonMobil, Shell and BP prospered accordingly. Other firms, like Coats (textiles), Pullman (railcars), Singer (sewing machines), Anaconda (copper), American Brands (cigarettes) and Navistar (agricultural machinery) were big players in major industries

Table 1: Top 12 Global Industrials by Market Capitalisation 1912

Rank	*Company*	*Industry*	*HQ Country*	*Equity Capitalisation ($million)*
1	USX*	steel	US	741
2	ExxonMobil*	oil	US	390
3	J & P Coats	textiles	UK	287
4	Pullman	railcars	US	200
5	Royal Dutch Shell	oil	UK/N	187
6	Anaconda	copper	US	178
7	General Electric	electricals	US	174
8	Singer	machinery	US	173
9	American Brands*	cigarettes	UK	159
10	Navistar*	machinery	US	160
11	BAT Industries*	cigarettes	UK	159
12	De Beers	diamonds	SA	158

* the modern names of these corporations have been substituted for their original 1912 ones: US Steel, Jersey Standard, American Tobacco, International Harvest and British-American Tobacco.

Table 2: Top 12 Global Industrials by Market Capitalisation 2001

Rank	*Company*	*Industry*	*HQ Country*	*Equity Capitalisation ($billion)*
1	General Electric	Electricals	US	398
2	Microsoft	Software	US	357
3	ExxonMobil	Oil	US	158
4	Citigroup	finance	US	260
5	Wal-Mart	Retail	US	257
6	Pfizer	pharmaceuticals	US	251
7	Intel	chips	US	211
8	IBM	computers	US	208
9	AIG	Insurance	US	207
10	Johnson & Johnson	health	US	180
11	British Petroleum	Oil	UK	175
12	Royal Dutch Shell	Oil	UK/N	170

that declined in relative importance. Might the IOCs go the way of these companies in the twenty-first century?

There are lessons to be learnt from the history of the IOCs, how they survived two world wars and the nationalisation of much of their oil reserve positions in the 1970s. How was that possible?

The ability to thrive notwithstanding the difficulties imposed by war reflected the strategic national importance that IOCs had, and their commensurately close relationship with government. And post-war that relationship remained strong, especially given the critical role that oil played for the economy. For example, looking at BP from 1950 we see the early high growth in production was very much a response to rapid economic growth (due to post-war rebuilding) and the rise of mass transportation.

By 1970 BP was producing over 4 million barrels per day. With nationalisation in the early 1970s BP's production was decimated. But with emphasis on New Frontier areas, the development of North Sea and Alaskan oil, exploration successes and a series of acquisitions, BP's production of oil and gas is close to that of 35 years ago.

Not all of the IOCs achieved the success of BP – of the Seven Sisters in 1970, three have been absorbed into existing companies: Gulf Oil, Mobil and Texaco. But BP's strategic approach parallels that of the surviving IOCs.

However, the IOCs have never been able to restore their strong former oil and gas reserve positions and this is a major point of competitive weakness going forward. Even the largest of the IOCs, ExxonMobil, has only one-twentieth the oil reserves of Saudi Aramco, the largest reserve holder in the world (see Table 3).

Some would argue that this is not critical, for ownership of reserves is but one part of the business equation and that access to capital and markets, with a command of leading edge technology and a capacity to implement mega-projects is the key to success in the coming decades – and this plays to the strengths of the IOCs. This position was well expressed by Jeroen van der Veer, the CEO of Royal Dutch Shell (RDS), in April 2005:

> I'd like to focus on three particular points. First: the successful oil companies of the future will have to be able to manage bigger, more difficult and more expensive projects. And they'll have to manage several of them at once – often in remote locations. My second point is that resource holder governments are going to need IOCs just as much as we need them. My final point is that fossil fuels are a growth industry, especially if we can find solutions for CO_2. To meet that increasing demand we'll need more and bigger projects. And, those bigger projects are going to require funding on a massive scale. The IEA estimates that the oil sector alone will require an investment between now and 2030 of $3 trillion. And we are already seeing some of these huge projects being developed. From Kashagan field in Kazakhstan, to the Athabasca oil sands, or to the Sakhalin LNG project we are in an age where the multi billion dollar project is becoming commonplace. The oil company of the future won't just need to be able to manage one of those projects at any one time, but will have to be able to execute several of them simultaneously.

"the IOCs have never been able to restore their strong former oil and gas reserve positions and this is a major point of competitive weakness going forward"

His expectation is that RDS will need the capacity to manage ten such 'elephant projects' by 2015. This is, of course, predicated on the view that, even as National Oil Companies (NOCs) strengthen their skill base and service companies increase their command of technologies, IOCs will maintain their access to these projects, at costs that allow them adequate returns on capital. But will this be possible in the future, as the oil and gas industry enters a new era, shaped by a number of new challenges?

1. The integration of China, India and other 'developing economies' into the world economy will create unprecedented demand for energy. Global energy demand could increase by more than half by 2030 with oil and gas expected to meet 60 percent of this demand.

Table 3: Top 20 companies by reserves, 2003

Company	*Country*	*State Ownership, %*	*Million barrels*
Saudi Aramco	Saudi Arabia	100	259,800
NIOC	Iran	100	125,000
INOC	Iraq	100	115,000
KPC	Kuwait	100	99,000
PDV	Venezuela	100	77,800
Adnoc	UAE	100	55,200
Libya NOC	Libya	100	22,700
NNPC	Nigeria	100	21,200
Pemex	Mexico	100	16,000
Lukoil	Russia	8	16,000
Gazprom	Russia	73	13,600
ExxonMobil	US	-	12,900
Yukos[1]	Russia	-	11,800
PetroChina	China	90	11,000
Qatar Petroleum	Qatar	100	11,000
Sonatrach	Algeria	100	10,500
BP	Britain	-	10,100
Petrobras	Brazil	32	9,800
Chevron Texaco[2]	US	-	8,600
Total	France	-	7,300

1. Now in effect controlled by government
2. Does not include newly aquired Unocal

Source: *Petroleum Intelligence Weekly*

2. The concerns over climate change could well lead to stringent new rules on use of fossil fuels.
3. The major conventional crude oil and natural gas resources remain concentrated in a few countries, especially the Middle East and Russia, giving rise to energy security concerns. For example, over half the proved oil and gas reserves is in the Middle East and the IEA estimate that oil exports from the region could rise by almost 75 percent and gas exports by 350 percent by 2030.
4. Conventional crude oil supply will almost certainly peak within 20 years, raising fundamental questions about the long-term source of liquid fuels. And conventional natural gas will peak later this century.

So can IOCs rise to these challenges?

The most positive response is that the IOCs have new markets to serve and only they can truly master the new business risks faced by the industry, including:

- uncertain geology,
- frontier conditions,
- new technology,
- environmental and social expectations,
- regulatory and fiscal changes, and
- volatile prices and margins.

However, the biggest risks are resource nationalism, disruptions in producing countries, the rise of new NOCs (especially in China and India) and new constraining environmental policies – all may compound the dificulties of IOCs in accessing reserves. These risks are not easily influenced by the companies, nor easily hedged against.

Since the early seventies the focus of the IOCs' portfolio was on diversity of production countries, with emphasis on 'politically stable countries'. Thus much of IOC production today comes from large fields in places such as Alaska, the Gulf of Mexico and the North Sea. These fields are now entering a phase of rapid decline, and the biggest threat confronting the IOCs is the rundown of reserves. But IOCs have not risen to the challenge and reserve growth has not kept up with production. In fact, with the current business imperative to seek high returns for shareholders, the preferred option for many companies has been to give cash back to the shareholder, particularly through buy-back of shares. All this seems to imply that the biggest firms cannot find enough good investment opportunities, and does not bode well for the future.

Are we witnessing a rise of resource nationalism? The fastest growing economies in Asia are resource-poor and will be large importers of oil and natural gas. They are looking to secure resources, primarily through acquisition and state-to-state deals. One particular consequence of this need is to bid up the price of oil reserves – and this is only exacerbated by concern over the peaking of easily accessible oil. And matters are only made more difficult by the overt nationalism in countries such as Russia, Venezuela and Iran, which limits opportunities and increases risks to IOCs. This behaviour also strengthens the position of the NOCs in these countries, as preferred instruments of state.

"Since the early seventies the focus of the IOCs' portfolio was on diversity of production countries"

With much of the conventional oil resource base closed to them, the majors are increasingly looking to 'unconventional' oil and gas, for example, Canada's tar sands, Venezuela's heavy oil and the large reserves of oil shale around the world – and there are

a lot of these resources potentially available, more than double that of conventional oil and gas resources.

Natural gas supply is seen by many as the great growth area for the IOCs. What makes gas attractive is its environmental friendliness – as a fuel for power plants it produces less local air pollution and contributes less to climate change than burning oil or coal. The IOCs have the edge over NOCs in developing gas because it is capital- and technology-intensive; getting it to market from remote places requires compressing and cooling it, and shipping it as liquefied natural gas. Unlike oil, which can be sold easily in the world market, gas needs to be marketed directly to end-use customers to be worth anything.

"Thus the future of the IOCs probably lies in big, technically complex integrated projects"

Thus the future of the IOCs probably lies in big, technically complex integrated projects. The problem is that these are unlikely to offer the returns that oil exploration and production have consistently given the IOCs.

So what of the future of IOCs? Much will depend on the openness of the global system and the opportunities for them. Two possible futures are worth exploring:

Firstly, an open world, in which energy security is defined against deep and wide markets, with diverse energy sources in play. Resource nationalism would be limited, but access to reserves may not be all that IOCs would desire. There would be strong global markets in finance and freer labour markets. IOCs would have no particular monopoly in finance or technology – although some companies would be more competent than others. IOCs would be strongly led by shareholders' needs, and this could lead to break-up or the slow liquidation of many companies, while others would be acquired by their bigger brethren. With deep financial markets and growth of private equity funds even the largest companies might find themselves prey to the financiers. As the century proceeds there would be only a handful of mega-IOCs left, undoubtedly covering the spectrum of new energy supply.

Secondly, a world shaped by national interests and nation states, in which energy security is defined in terms of those resources that can be strongly influenced and controlled. This would strengthen the role of NOCs and the IOCs would be increasingly linked with their governments, for example ExxonChevron with the USA and Royal Dutch Total with Europe. There may be a role for the most entrepreneurial of the remaining companies to thrive and go beyond parastatism (BP). Thus the ultimate irony would be that the IOCs which dominated the twentieth century would transmute into the NOCs of the twenty-first.

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Gas Prices in the UK: Markets and Insecurity of Supply

Philip Wright

The current debate about UK gas prices is curious for the fact that two of the most commonly-heard explanations for the unprecedented price levels in November 2005, UKCS depletion and bad behaviour in continental Europe, are refutable entirely on logical grounds – without reference to any empirical data whatsoever. The depletion of UK gas production means that the UK started to require net imports again in 2004 and probably to a greater extent in 2005. However, the mere fact of requiring imports should not mean raging prices. Many countries, for example, import gas and to a much greater extent than the UK in 2005. The point is therefore not the need for imports *per se*, but the fact that we were not properly *prepared* for this eventuality, including the possibility that the import requirement might grow in an unpredictable manner. The other explanation is a standard reflex – blame foreigners – in this case the rest of the European Union and its slow pace of market liberalisation. This explanation must however also be dismissed because there are no automatic grounds for believing that greater liberalisation of the European gas market would have the effect of protecting the UK consumer against price escalations – indeed, as we shall see below, once the causes of the current price escalations in the UK are understood it is entirely conceivable that greater EU liberalisation could make things worse not better.

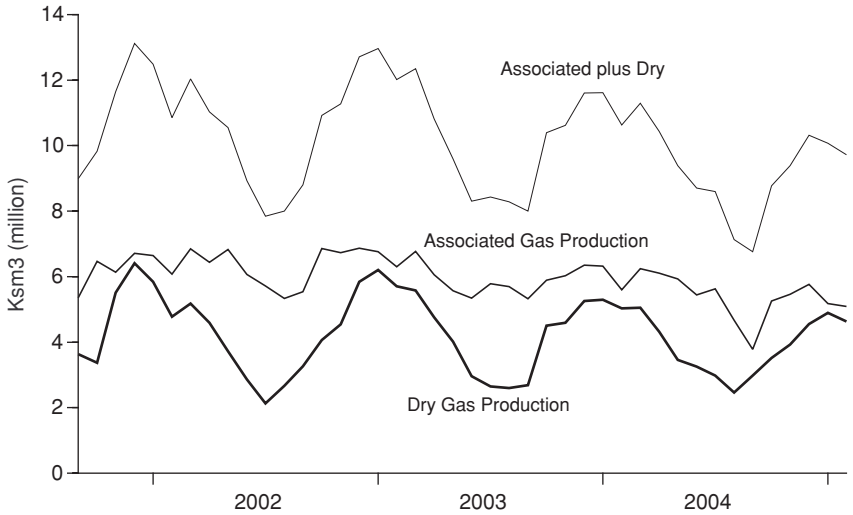
If, therefore, we are being mainly regaled with convenient red herrings, what has in fact been causing UK gas prices to rise to such unprecedented levels? Certainly demand, or prospective demand during a very cold winter, is an issue, but this has simply exaggerated the problem – demand did not play a significant role in the price spikes of October/November 2003 and August 2004 which were extensively investigated by OFGEM. The roots of the problem lie elsewhere.

First of all, while depletion *per se* is not responsible for high prices, some of its accompanying attributes have been playing a role. Ageing UKCS infrastructure in particular has been causing problems in the form of planned and unplanned maintenance shut-downs, both of which have been causing supply-side shocks. To this we can add the effect of a structural shift in the composition of UK gas production, away from the dry gas fields (gas only fields) of Morecambe Bay and the southern North Sea basin, towards an increasing predominance of associated gas produced by oil and condensate fields in the central and northern North Sea. By 2000, almost half of UK landed gas production was associated gas, rising towards 60 percent recently. The effect of this has been to reduce both the *flexibility* and *predictability* of UKCS production – associated gas production is subordinate to liquids production and cannot be 'swung' in the way that dry gas fields have previously soaked up winter demand on demand. Figure 1 illustrates both the relative inflexibility of associated gas supplies and the impact this has had on total supply – with peak supply available in successive Januaries diminishing over time.

But then these two factors might not have been such a problem had it not been for the impact of liberalisation. From well-head to burner tip liberalisation has opened up the gas chain to market intermediation, as market relationships have replaced those which were previously administrative, planned and reassuringly pedestrian. Liberalised markets – Months-out, Day-ahead, Within-day and Futures – thrive on information which was previously hidden inside the former, vertically-integrated monopoly that was British Gas and its long-term contractual relationships with the North Sea producers which it had successfully tamed to the considerable advantage of the British gas consumer. Now even small supply shocks may be amplified as suppliers and traders rush to take advantage of production outages at particular fields which were contracted to deliver for particular suppliers – who now have to make good the shortfall in the marketplace.

As OFGEM has discovered in detail

Figure 1: Monthly Variation in Total UKCS Production, Associated Gas Production and Dry Gas Production: September 2001 to January 2005

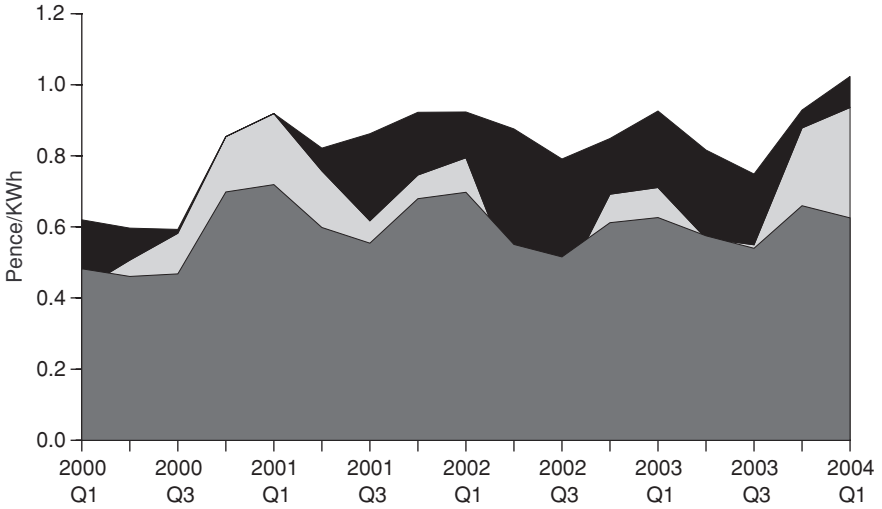


Source: *drawn up by the author based on data provided by the UK's Department of Trade & Industry*

from its enquiries into the behaviour of wholesale gas prices, markets amplify and echo insecurity of supply. A typical sequence might start with an unanticipated outage upstream which then immediately bounces in two directions: into the gas balancing market where the system operator (National Grid) might have to intervene with buy actions, signalling the need for more gas in the system in order to preserve safe pipeline pressure (linepack), and into short-term OTC (Over-the-counter) markets where the suppliers affected may try to make up their supplies. They may of course choose to do the latter by drawing down on their holdings of stocks, thus bouncing the price signal forward into the futures markets as, depending on the time of the year, market players become more or less anxious about the implications of having less than anticipated stocks to survive the winter.

Liberalisation therefore has a cost, in effect a risk premium, which may be observed in Figure 2. The bottom area is the so-called 'beach price' of UK gas: the actual unit value received by UKCS upstream producers for the gas they have supplied to the UK. The next area shows the extent to which an important futures price exceeds the beach price and, as can be seen, this is substantial during winter months – in other words, the uncertainty which grips competing suppliers about their supplies in the winter, even just one month ahead, potentially imposes a risk premium on consumers. This becomes more important because the contractual structure of UK gas supplies has been moving increasingly away from long-term, formula-priced, 'beach' contracts towards shorter duration 'gas-indexed' contracts – riskier contracts which use one of the various short-term market gas prices to price supplies at the time of delivery. (I use the term 'short-term market prices' rather than 'spot prices' because the latter does not capture the variety of markets which become involved in the pricing of gas.) My estimate is that over half of the UK's gas supplies are now being priced in this way, such that there is a correspondingly greater recourse to the (increasingly expensive) insurance offered by forward and futures prices.

Figure 2: Average Gas Price for Firm Delivery: Average Gas Price Received by Producers: Month Ahead Futures Prices



Note: This Figure is 'unstacked', such that each series is superimposed on the previous one(s). The bottom area plots the movements in beach prices, the next plots the movement in a quarterly average of the IPE front month index and the top area plots the movements in average prices for firm delivery.

Sources: *UK Department of Trade & Industry; International Petroleum Exchange (IPE)*

This cost of liberalisation, of the deintegration of the gas chain, affects wholesale customers much more than domestic customers for two reasons. Firstly, they tend to have much greater exposure to the more volatile short-term market prices, either because they are dealing directly with wholesale markets, and/or because they are making use of a greater preponderance of contracts which are gas-indexed. Secondly, because transportation and supply costs are much lower for large-scale consumers than for small-scale domestic consumers, particularly if they take their supplies directly off the national transmission system, they have correspondingly greater exposure to the behaviour of the gas cost component of their prices. However, and on the other hand, the extent to which changes in the wholesale cost of gas do actually affect the price of gas to industrial and commercial consumers depends upon the degree of competition in the industrial and commercial market. If competition is strong this will at least partially prevent suppliers from passing on costs to their industrial and commercial customers. And the evidence suggests that this is the case – in Figure 2, the difference between the average price being paid by industrial consumers for firm delivery and the futures prices has been subject to severe erosion – and it is this margin which must cover not only transportation costs, but also suppliers' costs and profits. It therefore comes as no surprise that even a company as strong as BP should choose to exit the smaller end of the industrial and commercial gas market in October 2004.

It has already been suggested that the behaviour of domestic prices is less influenced by the wholesale cost of gas than is the case for larger-scale consumers. The corollary is that the other costs which go to make up the final price of gas to domestic consumers will play a correspondingly greater role in the formation of domestic gas prices. This is illustrated in Table 1.

From Table 1 it can first of all be seen that transportation costs and the supply mark-up (costs of supply plus profit margin) have been contributing over half of the costs which make up the price of gas to direct debit customers, serving to reduce the strength of the relationship between wholesale gas prices and the final price.

Table 1: The Cost Components of Domestic Gas Prices

	Direct Debit UK Average less VAT	*Beach Price*	*IPE Front Month*	*Transportation Cost (British Gas Residential)*	*Supply Mark-up (using Beach Price as Gas Cost)*	*Supply Mark-up percent*
	– – – – – – – – – pence per KWh – – – – – – – – –					
2001	1.41	0.647	0.760	0.576	0.18	13.0
2002	1.48	0.601	0.591	0.548	0.33	22.5
2003	1.54	0.650	0.677	0.579	0.31	20.3
2004	1.63	0.710	0.876	0.572	0.35	21.5

Notes: the Domestic price used is the average UK direct debit price, excluding VAT. Transportation Cost is British Gas' transportation cost to its residential customers. Supply mark-up is a residual which includes supply costs and profits.

Source: *UK Department of Trade & Industry*; *Centrica*

Secondly, in 2002 the beach price cost of gas dipped but, coinciding with the full liberalisation of the domestic market, final prices actually rose – such that the supply cost margin jumped from 13 percent to 22.5 percent. Subsequently, in both 2003 and 2004, when the beach price cost rose again, final prices also rose again such that the supply cost mark-up was more or less maintained. In other words, this indicates that suppliers in general have been pursuing a strategy in which domestic prices have been unresponsive to gas costs when these have been moving in a downwards direction, but responsive when they have been moving upwards. It also indicates that it is the behaviour of the supply mark-up (i.e. price changes at the discretion of suppliers) rather than the wholesale cost of gas which caused domestic gas prices to run ahead of inflation in 2002. This particular conclusion is unaffected if the IPE front month index, rather than the beach price, is selected as the appropriate marker for gas costs – Table 1 shows that the IPE index also moved downwards in 2002. On the other hand, it could be argued that if the IPE index were to be taken as a proxy for gas costs in 2003 and 2004, then supplier price increases would emerge in a better light, particularly for 2004 when the futures price rose dramatically more sharply than the beach price. Such an argument would however have to contend with three issues. The first is that only a part of gas supplies (how much exactly is unknown) will be priced by the IPE Index. The remainder will be indexed to other short-term market prices or delivered at prices generated by remaining long-term beach contracts. Moreover, the gas supplies delivered to domestic consumers today will be at a cost determined by a portfolio of prices for today which were generated by either markets or contracts in the past (e.g. past futures prices for delivery today). The second issue is that buying gas at a futures price provides insurance against price risk and as such contains a cost which is more properly a 'supply cost' than a 'gas cost'. The beach price is therefore probably the most legitimate measure of average gas costs to suppliers.

Thirdly, one aspect of company strategy to manage the financial risks of the UK's liberalised gas market has been to rely on captive domestic consumers to more than absorb changes in costs, for example by raising prices to a greater extent than is justified by increases in the wholesale price of gas. We have already seen how this happened as price controls were completely removed for domestic consumers in 2002. That this was again the case in 2004 may be illustrated with a more specific example: despite losing 819,000 gas customers between 2003 and 2004, the 2004 price rise to which this is attributed also helped British Gas to increase its operating margin on residential energy sales from 2.6 percent to 4.6 percent, thereby raising its profits on this segment of the market by 83 percent from £136 million to £249 million.

The recent behaviour of UK gas prices emerges from this discussion as driven by supply shocks, by insecurities of supply, the impacts of which are magnified by liberalised markets. The price of gas to industrial and commercial customers reflects these to the extent allowed by competition in this segment of the market. The price of gas to domestic customers then reflects, in addition, the discretion exercised by suppliers as they raise their margins to both increase profits and to confront the financial challenges of the UK's liberalised gas markets.

The implication, finally, is that both UK and other European Union gas consumers should therefore beware the consequences of allowing the UK government to convince them that the UK gas price problem is down to the slow pace of EU liberalisation, and not homegrown in the UK. Why would liberalisation not have similar effects in continental Europe to those which it has had in the UK? What if the sort of European supply-side shocks listed by OFGEM as having played a role during a previous price hike in autumn of 2003 (the weather, delayed LNG deliveries, problems with coal barges on the Rhine) were to be immediately reflected in European market sentiment and then transmitted instantly to the UK in the same way and to the same extent that supply side price shocks are already amplified by liberalised markets within the UK itself? Indeed, German suppliers and consumers are reputedly relieved that their old-fashioned long-term contracts largely protected them from the short-term market shock which might have been delivered by the recent dispute between Russia and the Ukraine.

The Engineering Procurement Construction Industry

Malcolm Harrison

Introduction

The world we inhabit finds itself at the junction of an exceptional coincidence of events:

- World GDP has experienced a period of rapid growth since 2002, notably in 2004.
- Oil prices have breached their previous absolute highs on several occasions.
- Gas prices in both Europe and the USA are 'reaching for the sky'.
- For the first time for decades there is a shortage of refinery capacity for transport fuels

"With cost inflation comes time, or schedule, inflation as vendor fabrication shops fill"

Not surprisingly, this 'perfect storm' has provoked exceptional capital investment plans in the oil, gas, refining and LNG sectors, with many of the national oil companies and the independent oil companies revealing investment plans higher than in recent years.

The world has seen surges in oil price before but this time things are different:

- The surge is driven primarily by a robust growth in demand.
- World economies are mostly healthy and more resistant to higher oil prices then heretofore.
- It will take time to design and install the plant and equipment to rectify the supply shortcomings.

It is the latter of these that represents the single greatest threat to the increased demand for energy being met without further spikes in price. Supply shortcomings are evident throughout the supply chain, through shortage of drilling capability, shortage of commodity materials, shortage of critical equipment and, most importantly, the shortage of human capital to define, manage and implement the many and varied complex projects currently planned.

We can conclude from this that constraints on the supply side will continue to dominate the markets for several years and that there will be tremendous incentives for those companies who can most effectively surmount the supply bottlenecks. In this article we look at the world as seen through the eyes of an Engineering Procurement Construction (EPC) Contractor and provide some pointers to initiatives which are, or which can be, taken to ensure that the supply side responds to the rapid growth in demand as fast and effectively as it is able.

The Problem

Not surprisingly the response to the surge in energy prices has been a surge in capital investment plans. The National Oil Companies of Saudi Arabia, Kuwait and Qatar are all implementing well-known and very large project portfolios. The 'easy oil' is mostly in the hands of the NOCs. The International Oil Companies (IOCs) are being pushed towards new technical frontiers, in deep water, in arctic conditions and in areas with high political or country risk. Between them, the NOCs and IOCs are calling upon a large volume of capable EPC expertise, and both volume and quality of human capital, in order to overcome the technical risks associated with new frontier oil. Much technical expertise has left the oil companies in the last decade or so, as many of them consciously reduced their engineering capability. The contracting companies are now the main source of that support.

Nor, however, is the contracting industry currently either fit or healthy. It is at the end of a long period of relative famine and contraction; it has a large number of players, and is fiercely competitive. As recently as 2003 the net earnings of the world's largest ten E&C companies were negative and in the ten-year period to 2003 they have fallen in both real and absolute terms. Contrast this with the ten largest oil companies who have seen a threefold growth in earnings in the same ten-year period. The contracting industry is like a retired and battered 75-year old who is being asked to run a marathon.

The Consequence

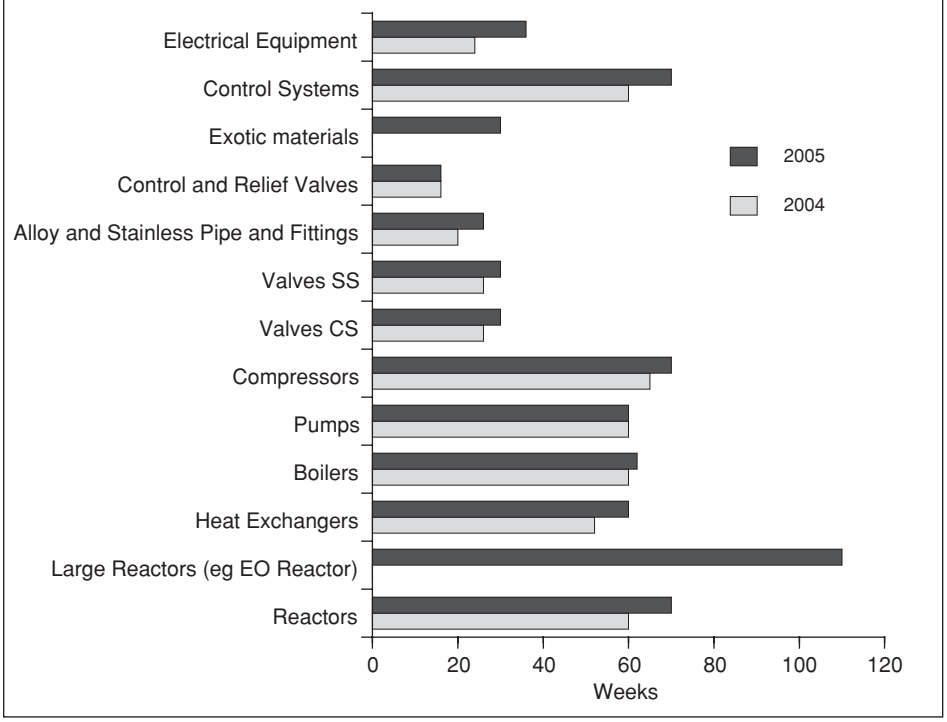
The consequence of a continued imbalance of demand and supply; and of a large number of owners trying to satiate a great thirst from a pool which has been growing only slowly is, in the first place, obvious…inflation. The second order effects are maybe less obvious.

"While the construction industry is in boom, the EPC contractor, paradoxically, finds himself in a period of high risk"

Inflation comes in two forms: Cost inflation and time inflation. The industry has already been experiencing the impact of cost inflation with the surge in commodity prices from steel, through cement, aluminium and so on.

With cost inflation comes time, or schedule, inflation as vendor fabrication shops fill and they too scramble for access to the raw materials and human capital they need to deliver their goods. Figures 1 and 2 show the growth that we have seen in delivery times and prices for a range of equipment in the last year.

Figure 1: Delivery Lead Times



For the EPC contractor the consequences are complex. The execution of a large EPC project requires the coordination of thousands of activities, the specification, procurement and installation of tens of thousands of equipment items, parts and components. While the construction industry is in boom, the EPC contractor, paradoxically, finds himself in a period of high risk. Rapid inflation in some commodity and materials prices cannot be accurately forecast; despite the most complex and proven project management tools, there are still a multitude of reasons why a project can be delayed and for which our historical risk norms and experience do not equip us. This is an environment in which it is all too easy either to become rich or to go bankrupt. If this is a dangerous environment for the contractor it is more so for the project owner or financier whose downside and upside are both that bit larger.

As we sail into new waters, it is clearly appropriate that we re-examine some of our historically proven methods for the management of projects.

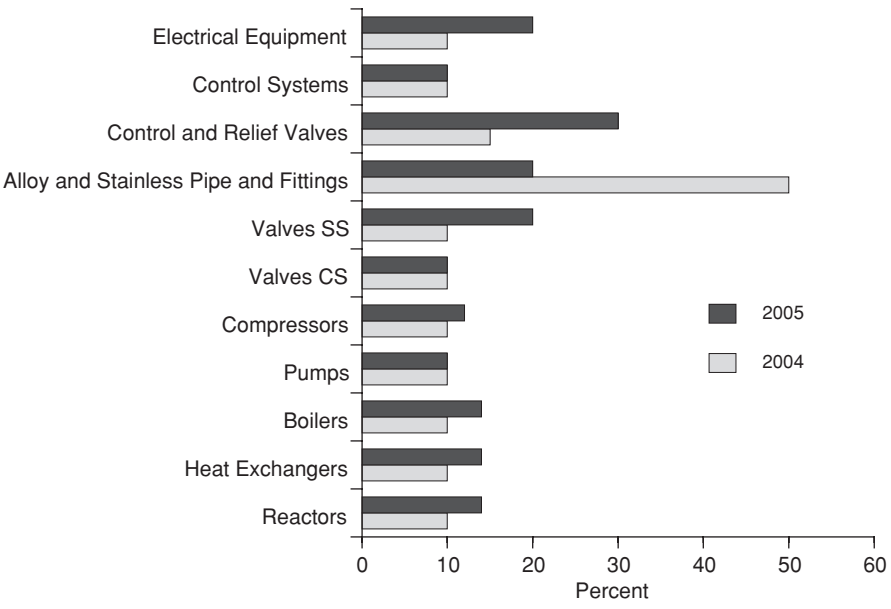
The Solutions

The reader should note the plurality of the heading above. There is in fact no single solution, nor even a combination of solutions, that will totally alleviate the problem. Prices have, and will continue, to rise; project schedules have, and will continue, to grow. This is likely to persist for the next four to five years unless some unforeseen event acts to reduce demand. There are, however, a number of actions that we have seen and have initiated which we think will reduce the impact and reduce the risk.

Contracting strategies are changing. Many companies are now looking at contracting strategies which distribute the share of risk more equitably and which provide a carrot for good performance as well as a stick for poor performance. An industry where EPC contracts have been dominated by Lump Sum Turnkey (LSTK) contracts is now seeing the wide application of:

- EPC contracts where a reimbursable contract is converted to LSTK through open book conversion. This gives the investors the ultimate insurance of end cost and schedule before the final investment decision is made and also ensures that the contractor has sufficient time to manage his own risk, thus widening the potential market of bidders.
- Reimbursable contracts with performance incentive. These contracts obviously place more risk with the owner but in turn ensure that both owner and contractor objectives are aligned and provide the owner with a wider number of potential

Figure 2: Price Escalation



contractors with the ability and the appetite to bid.

This development has further to run, both in extending a trend towards client/contractor alliance or partnership and encouraging a larger number of clients to participate.

The increased risk requires a better management of the supply chain. This can take many forms, from an increase in quantity and focus of managing timetables or through partnering with suppliers to understand and upgrade their capabilities. Initiatives of this kind, however, are ultimately directed towards improving the contractor's competitive situation.

More important than management of the supply chain is the growth in supply capacity. One important element of the supply chain management is the development of fabrication and construction capability, the so called 'local content'. There has long been an appetite in the project host countries to expand local capability; there is now an imperative that this be met. A contractor with a global reputation is able to exploit its local presence and global procurement capability both to identify new and local suppliers and contractors and to work with them to expand and develop their capability.

"Many companies are now looking at contracting strategies which distribute the share of risk more equitably"

One initiative in which we can claim success is in moving the construction to the labour pool as opposed to the conventional and opposite approach of moving the labour to the construction site. One interesting and current phenomenon is the number of large complex projects which are being built in economies already booming but where the construction labour and supply market has not been well developed. The Middle East is particularly active, but so too are Australasia and the Asia Pacific countries. For obvious reasons it is those countries with labour resources that are seeing the greatest growth, while conversely the oil-importing countries are negatively impacted. The latter are seeing pressure on their economies, downward pressure on salaries and upwards pressure on unemployment. Through the use of onshore modularisation – of the type very familiar to offshore industry – we have been able to move significant quantities of work from areas of labour shortage to areas of labour availability. We have seen that this can have benefits on cost – due to the saving in labour costs – but has definite advantage in scheduling and schedule guarantees. It allows offshore construction to be decoupled from site preparation and civil works.

"One initiative in which we can claim success is in moving the construction to the labour pool"

The last, most important and probably most difficult initiative is the increase in human capital**.** This is a journey that has several steps:

- The first step simply involves hiring. The EPC industry has seen contraction in recent years so in its first phase of growth was able to attract back to the industry those who had left.
- The second step involves a large number of fishermen fishing in the same pool and escalating the price of fish. This ultimately has the effect of rendering previously marginal projects uneconomic.
- The third step involves moving work to people rather than people to work. There are large and capable labour forces in India, China and Russia who, with management and support, are capable of growing their skills and expertise. India is the current favourite for this expansion due to its cost competitiveness, English speaking and relative ease of market entry.
- The fourth step is to widen the pond in which we fish. The recent expansion of the EU and the easier flow of labour across borders have multiplied the number of potential European based companies, with Poland, Romania, Hungary amongst others being a source of capable and mobile engineers and technicians.

All these four steps, however, are basically aimed at the increase of market efficiency. The fifth and final step, the only one with real long-term benefit, and, of course, the hardest to achieve, is to encourage schoolchildren and university students to pursue technical and engineering qualifications. The industry finds itself poorly placed to do this. The oil companies and the engineering contractors in the first world have spent the last two decades in contraction and have offered little scope for recruiting. For example, Chemical Engineering graduates have reduced year on year for over a decade. It will be very hard to reverse the flow and to change the image of the industry. Clearly price signals from the market will have some impact but the market also needs some external encouragement. This is beyond the scope of individual companies and can only be initiated at an industry or government level. There is, however, always the danger that, when and if the new graduates emerge from their educational production line, the oil price will be back to $10 and the jobs will be in a different industry.

The Gas Exporting Countries Forum and Europe

Hadi Hallouche

Gas and Security of Supply in the EU

With the Russia-Ukraine gas dispute in January 2006 and a particularly cold winter in Europe, including the UK, natural gas has hit the headlines. The geopolitical dimension of gas has become ever more important as gas supplies come from ever further away.

The depletion of reserves in the OECD, high prices and a tense international political situation, have given security of supply a whole new meaning. At the European level, the Commission has passed the Security of Supply Directive and there is also discussion about an EU wide energy policy in which security of supply will be key. Gas will be at the centre of this debate.

"selling gas is as important to the producers as buying it is important to the consumers"

Gas can be imported by pipeline or by LNG. The former is cheaper for short distances and links, exclusively, one supplier to one, or more, buyers. The latter is more economic for longer distances and is becoming, slowly but surely, a market with many buyers and many sellers. In the nineties and early 2000s, LNG had a high importance to South European markets such as Spain and Italy. The prices witnessed in the UK last winter have demonstrated how important LNG can be in North Europe, especially in the period of low supplies that we are witnessing today.

Because of the cost of transporting LNG, the global market is divided into two regional markets: the Atlantic and the Pacific. Liberalisation of the gas market in Europe, pioneered by the UK more than a decade ago and followed by the two EU Commission Gas Directives and a series of Competition Rules in the late nineties and early 2000s, combined with the high recent US prices, has transformed the Atlantic market.

Security of Supply vs Security of Demand

In these times of security of supply concerns, particularly with the Russia-Ukraine dispute in the background, there are inbuilt fears aroused by the media and by some policymakers that gas can be used as a political weapon. Nevertheless, selling gas is as important to the producers as buying it is important to the consumers. Many producers depend heavily on exporting hydrocarbons in general, and gas in particular, for their growing populations and fast developing economies – more so if prices are as high as they are at the time of writing. The geopolitical equilibrium of inter-dependence and diversification that the market is witnessing is beneficial to both producers and consumers alike.

Having said this, however, the market will remain cyclical. In a period of tight supply that is being witnessed today, and which is likely to remain, at least in the short term, it is important for Europe to make itself an attractive buyer of gas, as attractive as the United States, with which it is competing for supplies.

The Gas Exporting Countries Forum (GECF)

The GECF was set up in 2001 in Tehran by some of the largest gas exporters, including Algeria, Iran, Nigeria, Qatar, Russia, Indonesia, Malaysia, Brunei and others. Norway attended as an Observer. The GECF meets at the Ministerial level on a yearly basis and at the experts level two to three times a year, to share information, data, research, views; discuss projects, markets, human resources…and so on.

The Ministerial Conference of the GECF met in Algiers in 2002, Doha in 2003, Cairo in 2004 and Port of Spain in 2005. It was expected to meet again in Caracas under the Venezuelan presidency in 2006 but there are, at the time of writing, rumours that the meeting might be moved to Doha.

The GECF Members discuss projects of potential mutual interest, such as a contracts database and a supply-demand model, in order to have a collective insight into potential situations of global over-supply or under-supply. It is a loosely structured organisation that has slowly but surely gained structure with the setting up of an Executive Bureau in Cairo in 2004, and a liaison office in Qatar, which was established at the Port of Spain meeting in 2005. The GECF does not have a secretariat.

"The GECF, however, was not set up to be a cartel"

The GECF has often been accused of being a Gas OPEC in the making and, indeed, its structure increasingly resembles that of OPEC, with, for instance, seven of the eleven OPEC members being also members of the GECF. The GECF, however, was not set up to be a cartel. Gas producers do not want, nor do they need, such an organisation, as it would not serve their interests, economically, strategically or politically, and certainly not in the current market conditions:

- In the first place, when prices are high, supply is tight and the industry is still in its infancy, any collective action between suppliers would be counter-productive.
- Secondly, oil and gas are different commodities: while there is an international price and a global market for oil, gas is still a regional market dominated by long-term contracts with a regional pricing structure.

- Thirdly, demand elasticities for oil and gas are different; while the scope for oil substitution is virtually non-existent, gas is highly substitutable in power generation by coal, nuclear, renewables and, as is the case in the USA, by oil products. As the oil shock in 1973 prompted a worldwide effort of diversification of fuels away from oil, any 'political' or cartel-like use of gas would prompt an even wider effort of diversification away from gas.

It is however instructive to observe how the GECF has evolved. Since its first meeting in 2001, the membership grew and consolidated around all the existing LNG players except for Australia and the United States, together with important gas players such as Russia, Iran and Venezuela. The combined GECF membership in 2004 totalled 97 percent of the world's LNG exports, about 90 percent of the world's gas reserves, 40 percent of the world's pipeline exports (Norway and Canada are not members) and 40 percent of the world's gas production. These market shares, even by OPEC standards, are significantly high. For instance, in Europe in 2004, 53 percent of the pipeline imports and 100 percent of LNG imports came from GECF members – that is 38 percent of total gas consumption.

Security of Demand and EU Regulations: An Important Driver for the Creation of the GECF

As mentioned above, security of demand for gas is as important for sellers as the security of supply is important to buyers. Natural gas trade has always been based on mutual trust, since its infrastructure is highly capital intensive.

One of the important reasons for the creation of the GECF, and a major subject of discussions in its meetings, are the regulatory changes within the EU, which were initiated without, or with very little, consultation with the sellers. The liberalisation of gas markets, introduced by the Transportation and Energy Directorate of the EU Commission (DGTREN), had an important effect on the suppliers. But more significantly, the changes made to the competition rules, introduced by the Directorate for Competition (DGCOMP), have had an even greater effect, and have raised key concerns for the sellers. The most controversial of the changes in the competition rules is the phase-out of the destination clause. The destination clause is a customary clause in natural gas long-term contracts restricting the offloading of the gas/LNG to one, or a number of, destination points. The rationale behind this was to justify pricing at locally competitive levels for the buyer and a netback for the supplier.

"It is highly unlikely that gas will ever be used as a 'political weapon' under the collective auspices of the GECF"

The most contentious element is that the new competition rule implementation was retroactive, applicable not only to future contracts but also to existing contracts (some of which were negotiated more than a decade before the rules were published). DGCOMP has been criticised by many EU Member States and by the sellers, who found themselves with the obligation to renegotiate contracts. Additionally, the change in the destination clause has given the opportunity to many gas buyers to redirect cargoes to the USA, where prices were coincidentally much higher, resulting in arbitrage profits for the buyers (later renegotiated to be shared with sellers). This had the related result of creating under-supply within some consuming markets in Europe, which formed the basis of the criticism of Member States.

The change in these rules was one of the drivers that prompted the GECF to be set up. Members of the GECF who were particularly affected by the changes, such as Algeria, Russia and Nigeria, strongly criticised the process (rather than the substance) under which the rules were introduced. The issue of the destination clause, however, has not been resolved by the GECF, even though meetings of the GECF (with some members who are not Atlantic area suppliers) have been able to develop appropriate arguments, nor has it been resolved at the political level. In practice, each specific case has been negotiated between the relevant parties, usually resulting in a mutually-beneficial profit-sharing mechanism.

The important element, bearing in mind the 'security of supply versus security of demand' principles, is that the EU acted as a monopsony since it *de facto* set the rules for the most important LNG buyers in the Atlantic at that time – France, Italy, Belgium and Spain. This was not consistent with making itself an attractive destination for scarce LNG supplies compared to the more attractive, liberalised, transparent, high priced US market.

The GECF and Potential Coordinated Export Policies

It is highly unlikely that gas will ever be used as a 'political weapon' under the collective auspices of the GECF. Certainly, under existing market conditions there is no theoretical or practical case for the GECF to develop any cartelisation or coordinated export policies. It is, of course, possible that joint export policies might be discussed and developed when the industry cycle shifts from a sellers market, as is the case presently, to a buyers market, with a situation of over-supply, particularly if there were at the time other issues of confrontation with the EU Commission, related, for instance, to joint-bidding or profit-sharing mechanisms.

Selling gas is as important to the suppliers as buying it is important to the consumers. If any joint export policy were to be developed by the GECF (which, if it occurred, would be different from anything decided by OPEC because of different international trade and political realities and the fundamental differences between oil and gas as commodities) it would not have any security of supply implications for the buyers, given that the market by then would be amply supplied. Even so, it would be interesting to observe how both the GECF and the EU might react in such circumstances.

Some Farewell Comments

Ian Skeet

I have just made an editorial decision that, after being in some sense responsible for Forum for 35 issues, and having been, in some other sense, involved on the fringes of the energy business for even more than that number of years, I might bow out with a few remarks of my own, for which neither Forum nor the Institute is, of course, in any way responsible.

Years ago I wrote a book on OPEC and you might, I suppose, expect me to start with some up-to-date comments on an organisation which is still demonised in some quarters and held responsible for many of our energy problems. However, now that we have 'dialogue' institutionalised, with its own Secretary General, in Riyadh, and the oil market taken over by financial wizardry, there's not much to say about those trusty old OPEC subjects of production, reserves, quotas and price. Even so, there is not much advantage in demystifying OPEC too much since its meetings and pronouncements still provide an important component for the generation of oil market activity by traders and fund managers.

"There's plenty of energy around in the world and it's all for sale"

What I will do instead is to draw your attention to something quite different, and that is the relationship and relevance of OPEC to Saudi Arabia. They have been interdependent ever since Tariki, on behalf of Saudi Arabia, helped to create OPEC and, it has seemed to me, OPEC has ever since provided for it a sort of insurance policy. Saudi Arabia has needed this since it is a country that mixes potential power in terms of oil with weakness in terms of politics. Regionally it has been fatally dependent on US support and, with its relatively small population, has always been (or at least felt) threatened by its far larger neighbours, Iran and Iraq. This has, in turn, inhibited Saudi Arabia from flexing its oil muscle, if and when it may have wanted to do so, without the assurance of regional, or some other, support. OPEC has provided much of that support over the years.

If you pursue this idea further it may be possible to interpret Saudi policies through the agreements and disagreements of OPEC. In other words, a study of decision making in OPEC may illuminate the successes and failures of Saudi regional and foreign policy. Since for most of us who are not Saudis the internal machinery of government and policy-making is a mystery which it is difficult even to discuss in public, perhaps some PhD student could apply his or her mind to it and see if an analysis of OPEC deliberations could help us to understand Saudi Arabia rather better than most of us can now manage.

Let me now look at the question of energy security, a subject which becomes of overpowering concern only when something in the system breaks down. Surely we should have learned by now that absolute security is relative in every aspect of our lives and that really it shouldn't be assumed for energy any more than for anything else. The fact is that energy, and oil and gas in particular, is such an international commodity that it is that which in practice provides its insurance policy. When and if something goes wrong in the system there already exists as much backup as ever could be replaced by some other 'secure' arrangement. The arrangement least likely to help is energy 'independence', and whenever a politician starts demanding national (or these days regional) energy independence you can be sure that it's a disguise for something quite different. There's plenty of energy around in the world and it's all for sale. If politics gets in the way for some reason you can be sure that energy independence won't be the solution. The best bet would seem to be diversification.

Thirdly, there is the knotty problem of the environment. We can by now, unless we are unreconstructed academics demanding 100 percent scientific proof, be sure that CO_2 emissions are affecting and threatening our world's climate, even if the time-scale for actual disaster is far less certain. We can be sure, moreover, that our power stations, factories, houses and automobiles are the main causes of climate change. We do not, however, have to be unreconstructed sceptics to doubt the practical effectiveness of the Kyoto agreement as the mechanism for changing climate change. It provides a band-aid to prevent too much blood spilling on the floor, but that's about it. Wind, sun and water are going to require a supplement of something considerably more robust if we are to get nature back on track. But this is not to suggest that Kyoto is useless. Far from it; it provides a signal that a great number of countries and people accept that the threat exists and that they are, to a greater or lesser extent, prepared to do something about it. Twenty years ago only a few suspect scientists preached this message; today, only a few suspect scientists deny its validity.

"Twenty years ago only a few suspect scientists preached this message; today, only a few suspect scientists deny its validity"

If, however, Kyoto by itself is in practice unlikely to do much to solve the problem, what will solve it? The best bet would seem to be technology, infuriating though this may be to all those who can't bear the thought that the United States might be right after all. But even if we grant that technology is likely to be more effective in

the long run than Kyoto we still have every reason to berate the USA for not joining in the Kyoto effort as the only current, even if insufficient, measure available and failing, as a result, to underwrite the seriousness of our planet's situation.

"the content of energy policy is invariably no more than the distribution, or redistribution, of either subsidies or taxes"

Environmentalists unfortunately tend to be particularly, if not emotionally, attached to solar and wind and wave power well beyond their capacity to give a sufficient answer to the CO_2 emission problem and at the same time to provide the energy required now and still more in the future by the inhabitants of our world. If you look for a moment at the distribution of primary energy resources in the world you will quickly notice that the USA, China and India have between them 50 percent of the world's coal reserves and that the proportion of coal in their total energy consumption in 2004 was 24 percent for the USA, 69 percent for China and 55 percent for India. It is surely self-evident that these countries will not, whatever Kyoto says, stop using coal, which is after all the worst offending source of CO_2 emissions, and that the only practical solution is to find a technology that will sequester the CO_2 before it is emitted into the atmosphere. And that, of course, is one of the most active areas of research now being pursued in the USA (and elsewhere). They will no doubt succeed in this endeavour and in, say, ten years we shall have the ability to burn clean coal. And no doubt we shall also have clean automobiles to drive in the same sort of timescale given the research being put into hydrogen and batteries. But, whatever happens, we shouldn't forget that our existing stock of dirty power stations, factories, houses and automobiles will remain in use for decades to come. Technology will do far more to save this planet than Kyoto, but Kyoto has provided, and will continue to provide, a vital catalyst for ensuring it will happen.

There is then the related question of energy policy. This is a subject dear to politicians who believe that, if only things were to be left to their own management, all would be solved. While attempting to satisfy all lobbies they usually mess everything up. In practice, the content of energy policy is invariably no more than the distribution, or redistribution, of either subsidies or taxes and there needs to be a logic behind them which has a reasonable chance of achieving whatever is being sought. Unfortunately this is often not the case. And, in this context, it's worth reminding ourselves that the climate is the ultimate globalised commodity and that trying to deal with it in a competitive fashion at country level is pointless. Beware of energy policy. Goalposts are, of course, needed, but moving them is, perhaps, the most potentially counterproductive, but politically attractive, activity open to lobbyists of every shape and size.

"For years, experts and non-experts of every kind have been tilting at the windmills of perfect data"

Another subject, rich in quixotic implications, is information. For years, experts and non-experts of every kind have been tilting at the windmills of perfect data. If only we could know accurately and quickly the figures for oil demand, production and stocks (stocks in particular) we would be better able to … do what? Would such information, which by definition can never be immediate, have led, or might it lead, to different decisions by producing companies, energy companies or any government on investment or operational concerns? It might encourage greater activity by the traders and analysts, but that is hardly the point. But keep hoping, an organisation called JODI has recently been set up to give us more and better data more quickly, even if we are still waiting for it. And, who knows, one day it might actually succeed in transfixing one of those windmills.

Lastly, we come to the energy companies themselves, without whom it seems improbable that we shall have any form of energy at all. It's a strange reaction, when you come to think of it, that we should assail companies for perceived failings when we are so dependent on them, and when on the whole most of us would probably agree that they do an effective job. Some of us attack them for not investing in whatever we happen to prefer, some for employing the wrong people, some for making too much profit, some for not making enough. There are investors, usually disguised as analysts or fund managers, who demand instant financial gratification at least every three months even though they know perfectly well that energy is a long-term business. There are consultants and theorists who know far better than the company's management how the company should be managed. Et cetera … and not forgetting the politicians who know better than anyone else how everything should be run. Even so, one may, of course, have a legitimate worry or two, and one of them is this. Energy companies get bigger and bigger but their capacity for expansion is presumably not limitless. At what point will they implode or, like Gulliver, be so tied up in their own, or externally imposed, red tape, regulations and guidelines that they cease to know what they are doing and become unable to react at all?

Oh, I nearly forgot supply, demand and price. I bet you (though I may not be around to collect my winnings) that in 2025 supply and demand will be in balance and that the price will be sustainable. Just as they always have been.

Not so long ago – as recently as the 1990s, the world was 'awash with oil'. Today, while oil reserves remain ample, production is hard put to keep pace with demand. True, there is a lot of political uncertainty to jack up the price of crude oil, through threats on capacity to produce, transport and refine it, but there is increasing recognition that much of the current price hike is demand induced. China's role deserves our attention.

China has long been an 'emerging' economy, standing out only because of its 1.3 billion inhabitants. China's impacts on world commodity, product and financial markets have been under-estimated almost across the board. Statistics were reputed to be unreliable and to have over-estimated China's economic growth. The latter was confined to its 'Pacific rim', leaving the hinterland to emerge from agricultural subsistence under inefficient control from the Communist centre.

Yet the examples of other Far Eastern economies have been staring us in the face for decades, telling us not to dismiss China lightly. Japanese GDP growth, particularly in the 1960s and 70s, South Korea's and Taiwan's in the 70s and 80s suggest that the PRC has a potential over several decades to grow its GDP by at least 8 percent per annum. China's latest Five Year Plan chalks in a 'modest' 7.5 percent per annum. If we add in that China is making a comeback from past economic glory and that the starting point back in 1980 was an 'anti-market' economy, then these targets begin to look low.

China has been upgrading the measurement of its economy to take better account of the service sector. Not only has the economy been sized up, making energy consumption per unit of GDP look more reasonable, but the growth rate of GDP has been revised to 9.9 percent p.a. from 9.4 percent p.a. for the period 1993–2004. Moreover, the OECD's first in-depth report on China, published last September, situates growth potential at 9 percent p.a., or more, for a considerable period. This is a formidable mover when such economic momentum is attained by 20 percent of the world's population. It could confound all those who say that recent performance is unsustainable and argue whether the overdue 'landing' will be 'soft' or 'hard'.

These observations make it all the more surprising that the sister organisation of the OECD in Paris, the IEA, has persistently under-estimated Chinese economic growth in its otherwise impressive annual *World Energy Outlook* publications. Every even year, the IEA provides detailed statistics – in particular, projections by decade

Personal Commentary

Derek Riley

and by primary energy source through 2030 across the world – which serve as a reference and benchmark for energy analysts. True, its focus here is on the long term, with 2010 merely a stepping stone on the way. Yet, for China, the 2010 projections look increasingly at odds with what the IEA publishes in its Monthly Oil Reports on the short-term aspects of the oil market.

As recently as the 2002 Outlook, the IEA's working assumption for China's GDP growth during the current decade was a mere 5.7 percent per annum. Admittedly, in its 2004 Outlook, the IEA revised upwards China's GDP performance, putting it at 6.4 percent for the period 2002–10, no doubt counting on an impending cyclical downturn. Yet the evidence of 2003 and most of 2004 was already to hand – a trajectory of over 9 percent p.a. growth in both years. 2005 notched up almost 10 percent. The result is that for the IEA's baseline assumption to be fulfilled in 2010, there is scope for only 4.5 percent p.a. GDP growth during the second half of this decade, even before the GDP revisions (4.3 percent p.a. after them).

As changes in demand for energy are a function of GDP and energy intensity (energy requirements per unit of GDP), any under-estimation of GDP growth must be made up by more efficiency gains than projected for overall energy demand projections to stay unchanged. The IEA has a reduction of 2.6 percent p.a. in energy intensity over the period 2002–10. If, however, projected energy requirements in 2010 are to be maintained and GDP continues to grow by say 8.5 percent, then efficiency gains will have to average 5 percent p.a. over the eight-year period. This is a tall order and requires a critical look at the assumptions and data.

China's estimated primary energy requirement in 2005 is already higher than the IEA's (2004) projection for 2010. It seems too that China's GDP has entered an energy-intensive phase, as the rate of efficiency gains has dropped to 1.6 percent p.a. over the last five years, after 7.3 percent p.a. throughout the 90s. Let's assume a 3 percent p.a. efficiency gain accompanying 8.5 percent p.a. GDP growth over the next five years. If this looks ambitious, it still leaves China's energy requirements expanding by 5.3 percent p.a. We can add a heroic assumption that indigenously produced coal supplies most of the increment for power generation, but woe betide the CO_2 emissions that go with it. Given the inertia and lead times to bring on capacity for the other forms of energy, oil inputs in this 'update' scenario are much more than just a residual.

China accounted for 6 percent of world oil demand in the year 2000 and 8 percent in 2005. By 2010, with these hypotheses its share will reach 10 percent, or some 10 mb/d (the IEA's latest figure is 8.7 mb/d). Perhaps more significant to world oil markets and prices is the size of China's net oil imports: 6 mb/d in 2010, after 3 mb/d in 2005 and 1.3 mb/d in 2000. China has difficulty in raising oil production and is scampering to secure reserves overseas. At a time when supply limits are being tested on a number of fronts, China's probable average annual addition to world demand and imports of some 0.6 mb/d can only add to tensions. It may be a long time before the price of crude oil gets back to its hypothetical equilibrium price of $30/bl. Reserves are not being developed fast enough.

Asinus Muses

Proof of the Pudding

We have a tendency to believe what we are told by scientists and economists, largely because they purport to have proved something. At the same time we know instinctively that this is unwise since all too often they disagree with each other. We now read that trees and vegetation, which are supposed to be part of the solution to CO_2, may be producing volumes of methane which may be doing more harm to the environment than the CO_2 itself. Even more upsetting is the proposition that aerosols produced by power stations may be more effective at cooling down the atmosphere than removing CO_2 from it. It's only a matter of time, one suspects, before someone proves that driving larger cars is preferable to driving small ones, and that, anyway, CO_2 is a good thing.

Dense Undergrowth

Asinus has always viewed consensus forecasts, particularly those dealing with oil price, as evidence of what won't happen. Recently he read of one that forecast the price of oil to be $65 in January 2007 with an 85 percent chance that it would be between $45 and $75. Now there's a really useful tool for the hedging enthusiasts.

Economy of Scale

There is something topsy-turvy in the fact that Iran has to import over 1,500,000 b/d of gasoline in order to be able to sell it to car drivers at 10 cents a litre.

Bottled Up

Someone has calculated that in the United States 1.5 million barrels of crude are required annually for manufacturing the plastic bottles needed for bottled water sales, a large proportion of whose contents are anyway supplied from municipal sources. The International Bottled Water Association (can it really exist?) says that 'we are responding to consumer demand', so that's OK.

On and Off

Asinus was particularly taken by the picture conjured up by President Bush's latest warning about the dangers of being oil-dependent on countries where tyrants control the spigots. Just imagine all those million spigots a day that the tyrants are turning on and off.

So What?

Did you realise that Latvia has a larger gas storage capacity than the UK?

Bonding

Asinus had a moment of panic the other day when faced by a headline which read: 'World's largest SUKUK listed on DIFX'. For a moment he thought it was a new Chinese-funded football club, but it turned out to be some kind of bond.

Command and Control

It's all very well to be told by your GPS system to turn left at the next crossroads, but how much more exciting it will be when you can download Galileo onto your mobile phone and be told how to reach the nearest Starbucks.

Ever-increasing Circles

These days we usually seem to be in favour of meetings, and a particularly awe-inspiring example was the 'Ministerial Round Table on Cooperation between North and Central Asian Producers and Principal Asian Consumers regarding stability, security and sustainability in the Asian Hydrocarbons Economy'. Having reached no conclusion, it will no doubt be reconvened with a larger number of delegations when stability, security or sustainability is again good for a meeting.

Safety First

More meetings. The preliminary draft of the G8 Action Plan for Energy included an item for the 'development and introduction of innovative nuclear power systems with natural safety barriers' as part of a system that will create a 'shock-proof' system of global supply. That medley of words was later modified in case it committed somebody to something, or indeed meant anything at all.

What's good for GM….

It seems that General Motors, which apparently builds 76 different models of automobiles, is trying to reduce that number. What will be the target, and what will be their average miles per gallon?

Place your Bets

Which EU member is going to open the bidding on emission allowances for the second period, 2008–12? Certainly not the UK which is trying to get to the back of the queue, chastened by its early generous, but uncompetitive, offering on the last occasion, which it was subsequently not allowed to alter. Naturally all EU members support the emissions trading scheme unreservedly – provided none of them is seen to be stealing some advantage over the others.

Worthless Workout

Someone has calculated that in the UK as a motorist you will pay £240,000 in car-related taxes in your lifetime, and that's before they've been raised annually. Car sales are rising.

Oxford Energy Forum. ISSN 0959-7727. Published by Oxford Institute for Energy Studies, 57 Woodstock Road, Oxford OX2 6FA, United Kingdom. Registered Charity 286084. Tel: (0)1865 311377. Fax: (0)1865 310527. E-Mail: forum@oxfordenergy.org EDITOR: Ian Skeet. Annual Subscription (four issues) £40/$75/€75.

Indexing/Abstracting: The Oxford Energy Forum is indexed and/or abstracted in PAIS International, ABI/INFORM, Fuel and Energy Abstracts, Environment Abstracts, ETDE and CSA Human Population and the Environment