NOC-IOC Forum

Kuwait City, Kuwait, 30-31 March 2009

Enhancing Global Energy Security through Cooperation and Partnership

Background paper

Introduction

This paper sets out some of the background considerations related to the key topics for discussion at the NOC-IOC Forum, to be held in Kuwait City on 30th & 31st March 2009. It also identifies several issues for the Forum to consider with a view to promoting greater co-operation between NOCs and IOCs.

The 11th International Energy Forum (IEF) held in Rome, 20-22 April 2008 "advocated increased cooperation between NOCs and IOCs as a major opportunity in addressing key challenges facing the industry" such as global energy security, investment uncertainty, increasing costs, complexity and risks of large investment projects and growing concerns about global environment. Building on the results of the 3rd International Energy Business Forum (IEBF) on the first day, Ministers in the Forum discussed how "the framework conditions for NOC-IOC cooperation can be improved to optimize its potential with due respect to the laws, rights and expectations of all parties".

At the Jeddah Energy Meeting held 22 June 2008, Ministers noted the increased price volatility and agreed that the situation requires concerted efforts from all parties. The Joint Statement by the Kingdom of Saudi Arabia and the Secretariats of the IEA, the IEF, and the OPEC called for "enhanced cooperation between national, international and services companies from producing and consuming countries in investment, technology and human resources development".

Energy Ministers and Industry leaders gathered at the London Energy Meeting in 19 December 2008 discussed the impact of the world financial crisis and economic slowdown on the oil industry and the adverse effect on investment of high levels of volatility in prices and agreed that further work should be taken forward to identify ways to promote optimal levels of investment and more transparent markets. In this regard, participants welcomed the work which the IEF was taking forward to identify best practices in addressing key challenges facing the industry.

The NOC-IOC Forum offers a timely opportunity to address shared concerns of petroleum industry stakeholders that have been highlighted by Ministers and participants in 11th IEF and 3rd IEBF, the Jeddah and London Energy Meetings and the past IEF events.

This Forum seeks to extend this dialogue to industry-level discussions in an attempt to find common ground on which to meet the challenges confronting the oil industry. The discussions and debates that will take place at the NOC-IOC forum will help the IEF Secretariat in preparing recommendations for Ministers and CEOs who will gather at the 12th IEF and 4th IEBF in Mexico in 2010, on energy policies to strengthen cooperation and dialogue between the industry stakeholders.

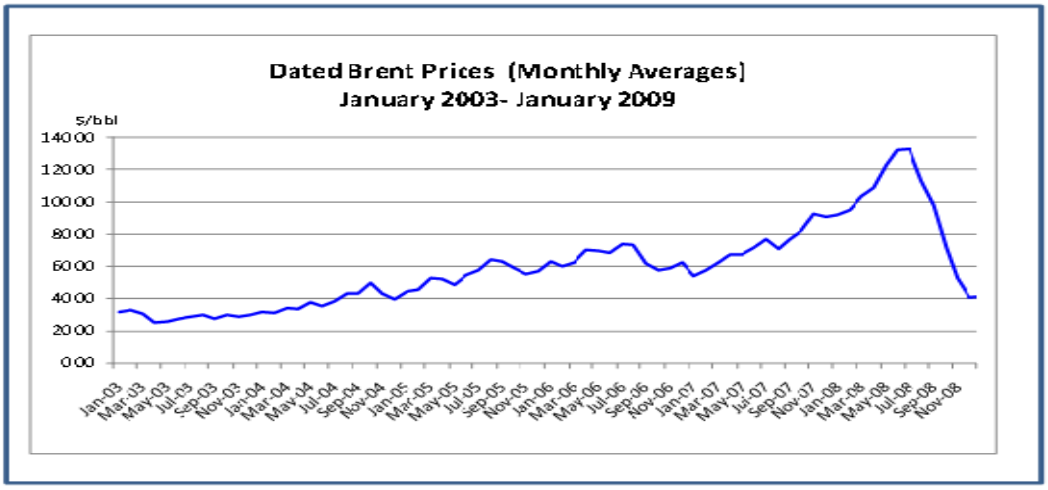
The three key headings under which this Forum is structured are:

- Market uncertainty and increased oil price volatility
- Ensuring adequate investments

- Increasing extended NOC/IOC partnerships in other areas

1. Market uncertainty and increased oil price volatility

Although oil prices have frequently shown erratic and volatile behaviour in the past, the speed and extent of the movements over the past year or so suggest that the functioning of the market has changed in some essential ways. Price formation seems to have become decoupled from what are usually considered the prevailing fundamentals. Whatever the exact causes of this, the rise in prices to a peak of nearly $150/bbl and the subsequent fall to below $40/bbl all occurred within the space of a few months.



Although in real terms the rise and fall of crude prices in the last year resemble movements witnessed in the decade between the mid-1970s and the mid-1980s, those changes were spread over several years and were triggered by identifiable market conditions of tightness and surplus, whereas the recent changes occurred in a few months and seemed, moreover, to be driven mainly by expectations rather than actual prevailing market conditions. The oil market now thus appears to mimic other, unrestrained, commodity markets open to widespread futures trading activity, with sentiment and speculation arguably playing a greater role than physical supply/demand balances in setting the price.

This degree of oil price volatility is detrimental to both consumers and producers. It creates "excess" profits or surpluses when the price is high and unreasonable losses when it is low. It intensifies uncertainties and threatens the ability of the industry to maintain consistency in investments. This in turn tends to encourage cyclicality in the business, thus helping to create the very environment that fosters further price volatility.

1.1 Short term concerns and long term vision

Although there are invariably wide differences of views amongst oil companies about potential supplies of oil and long-term equilibrium prices in the market, there is general agreement within the industry that in the longer term the supply side of oil is constrained, and that increased exploration and expanded investment in production will be required. Arguments about "Peak Oil" to the side, there is a consensus among most in the industry, be

they IOCs or NOCs that steadily higher prices will be needed to support the world's demand for oil in coming years.

Recent changes in the demand outlook may change the number of years in the future that demand will begin to press against supply, but no one denies that day is coming. Even if demand doesn't rise rapidly, depletion rates of existing fields make it clear that investments will need to be made on a massive scale and that current price level will not support the needed levels of investment.

As will be discussed in more detail later in this paper, the level of needed investment presented problems even before the recent collapse in the price of oil. Construction and drilling costs raced upwards with the price of oil for several years, and the world financial crisis slashed the capital available even for very sound projects at moderate prices. Costs remain high, capital remains short, and now the price of oil has fallen to levels that can't support even some ongoing projects.

The irony is that everyone—IOCs, NOCs, governments, and international energy analysts private and public—are in general agreement about the longer-term outlook. But there is a disconnect in the market between the longer-term outlook and the immediate situation the industry faces. While companies know that new investment is needed both upstream and downstream, it is hard to imagine a more difficult confluence of factors; to put it more simply, in terms of needed investments, how could it be worse?

The lower prices seen recently will help an ailing world economy—or at least are unlikely to harm it in the short term. In the longer term, though, lower prices mean more growth in demand. More growth in demand without the prices to support new investment means a greatly increased risk of another price run-up (and possibly another boom-bust price cycle).

IOCs and NOCs are sometimes seen as having opposing interests, but that is an over simplification. Companies are affected differently by price changes, and whether lower or higher prices benefit them depends largely on the composition of their business.

Prices that are unsustainably low or high, however, do not benefit anyone except in the short run. This is not just true of the hydrocarbon industry, but of other primary energy suppliers as well. Coal producers, the newly revived nuclear power industry, solar, wind, and conservation/efficiency improvements —all of these are threatened by fluctuations in prices. In many ways, the current low prices pose bigger problems for other energy sources than for oil.

But no one has control over the situation. Back in the 1980s, at an international conference, Japan proposed setting a floor price for oil so that E&P would be preserved and investments in alternative energy sources would not be threatened by oil-price volatility. The proposal was scoffed at by many, and vehemently opposed by others. Even those who thought it was a good idea in principle could think of no practical way of implementing such a plan globally. If there was political will for such a move (and there never has been yet), it would be hard to sustain when prices fall to the floor for any great period of time; and, of course, there have always been quarrels about how such a floor would be maintained and who would benefit. (If the floor is met through taxation it doesn't do anything to encourage E&P or reward producers for investing.)

A quarter-century after Japan proposed a worldwide floor price, there are still no practical proposals for how such a system would work and could be made acceptable to all parties. The biggest problem with the concept, apart from the thorny issue of implementation, is that the issue is only discussed when prices are low or falling—and the only logical time to introduce them is when prices are high, and no one's pocketbook is immediately affected.

Another problem is that a floor price is seen as benefiting only oil producers—although we argue that it benefits all producers of primary energy. Many governments are opposed in principle to price controls on oil, but those who aren't are likely to look for some guarantee of a ceiling in exchange for any floor.

There may be no pre-emptive solutions that will solve some of the problems the global hydrocarbons industry faces; the short-term situation may only fall into line with the longer-term fundamentals when the market decides to move. Nonetheless, it is useful for companies in the hydrocarbons—both NOCs and IOCs— to seek areas of common perspectives on both the near and longer term, and to discuss any possible solutions. Too many exchanges on the broader topics and issues are restricted to bilateral discussions or conferences where the focus is diffuse. Roundtable discussions within the real players in the global industry can at the minimum clarify current visions, and at best might result in the establishment of bilateral organisations focussing on specific objectives of improving present practices.

1.2 Price volatility, investment and operational efficiency

Quite apart from the uncertainties generated by volatility on future price expectations, which cuts across all investment decisions, this also impinges directly on the day-to-day activities of all oil industry operators. It affects the smooth running of the physical buying, selling and processing of crude oil and the marketing of refined products. The time-lapse between the production of crude oil and the selling of the refined product to the final consumer exposes all operating companies to a kind of profitability lottery which cannot easily be offset by the use of hedging activities alone.

Volatility also tends to cause major shifts in stock volumes, and high prices can leave end-users like refiners running at minimum levels required by local law and international agreement.

Intensified volatility in prices is in itself bad enough, but currently the industry is faced with the additional destabilising effects of weakening oil demand and low prices. To this cocktail of difficulties is added the problems associated with raising investment funds in the aftermath of the banking crisis. Investment issues are discussed in more detail in later sections.

This threatens a spreading investment paralysis across the different companies, whether they are NOCs or IOCs and throughout the whole value chain. In addition, as mentioned previously, large fluctuations in oil prices impact across the whole energy spectrum, affecting natural gas, coal and even electricity prices globally. The difficulty faced in the current situation is that some final consumers may welcome the short term benefit of low prices, if this level is unsustainable it inevitably leads to future price volatility, which cannot be in the interest of any parties, with the possible exception of speculators.

1.3 Can the industry adapt or take measures to counteract uncertainty and volatility?

The power of the industry to moderate price changes is limited, and its ability to control prices in modern markets is nonexistent. But there are structural changes the industry can pursue that can help dampen volatility.

Although legal restraints prevent many companies from discussing stabilizing, or indeed affecting, prices, there are areas of cooperation that would contribute to lessened price volatility without requiring that companies discuss price stabilization *per se*. The industry, in any event, cannot directly eradicate price volatility and it has limited ways to counteract its detrimental effects, but there are various areas where greater co-operation between the different companies can remove or weaken the stimulants to such volatility.

There are four areas in particular which are worth focussing on: increased spare production capacity; better use of storage (especially near consuming markets); greater producer downstream integration (especially in joint ventures); and, improved market transparency. The first three of these will be addressed here.

i) Promoting spare production capacity

It is generally accepted that some amount of spare production capacity provides to a cushion against excessive increases in price, but there are two problems, one economic and one political, in maintaining spare capacity.

The high capital intensity of oil operations means that economics encourage maximum utilisation of facilities. There is, therefore, a real cost to maintaining unused production capacity and it is therefore generally avoided (the major exception being in Saudi Arabia which has a deliberate policy of carrying excess capacity).

The political problem of spare capacity is that there is frequent pressure to employ it. Since IOCs do not normally maintain spare capacity (indeed if they were seen to be they would be accused by their shareholders of not maximising their returns and by governments of trying to manipulate the market), the political pressures to begin additional pumping usually fall on governments.

Spare capacity is therefore an economic burden to those that develop it, and a potential political headache for countries where it is located. Given those facts, it is hardly surprising that few in authority set out to deliberately develop additional capacity as a cushion, even though it would add stability to the market.

Nonetheless, the problem deserves serious discussion by the industry, if only to have an industry point of view to pass on to policymakers in government forums. From an industry perspective, what are the barriers to developing and maintaining spare capacity? How could companies, be they NOCs or IOCs, be compensated of earn a return for holding spare capacity? Who would pay, and through what mechanism? How should such a cost be distributed between exporters and importers? Perhaps most problematic of all, how would a decision to draw on spare capacity be triggered?

Returning to the perennial issues of price floors and ceilings, it should not be dismissed that a consensus on an approximate price floor cannot be attained, although it is more difficult to imagine a workable price ceiling without a large buffer of spare capacity to call upon. The

key to establishing this floor would be related to costs and since the operating companies, of all types, are better placed to know how front line costs are developing, greater exchanges of information in this area should help create realistic bench-marks from which to gauge where companies' assessments of a floor price could lie.

Even without direct control over prices, more open discussion about minimum prices, from across the industry spectrum, would send a signal to governments, and importantly, the futures market payers, who would be influencing short term price movements.

ii) More effective utilization of storage

In a sense, storage amounts to a kind of spare production capacity, but usually held close to the point of consumption and often in a form that is immediately usable. Most of the world's stocks of oil, however, are commercial and are required to ensure that the supply and distribution systems operate efficiently. Strategic stocks held by or under the auspices of governments, account for around one-quarter of total inventories, but their objective is to provide the supply of last resort in the event of a disruption to normal deliveries. Yet the line between the two uses of stocks has become blurred, with examples of strategic stocks being used to counteract market tension. Using stocks in this way should, in theory, be a more effective way of balancing the market than through the adjustment of crude oil production volumes since the effect is more immediate.

The archetypal strategic reserve is one where the consuming government owns and maintains the oil stockpile, but this is not the only model. Innovative deals where producer NOCs are holding stocks in consumer countries are already taking place. The Korean government, for example, has offered strategic storage facilities for commercial storage by IOCs and NOCs. Such an arrangement enhances Korean energy security whilst also providing commercial benefits to operating companies. Major users of the storage are Statoil as well as a number of Chinese companies such as China Oil, Sinochem and Unipec. We also understand that similar arrangements have been the subject of discussion between Saudi Aramco and the Japanese government over possible storage in Okinawa.

There are many obvious attractions to this kind of arrangement, which can simultaneously expand producer flexibility, consumer security, and the buffer of oil located near consuming markets. Producers could fill storage during times when demand slackens, and then simply replace at the drawdown rate demanded by their normal deliveries. . If this model were expanded - particularly in the context of the current plans to expand strategic stocks by a number of emerging market governments, a major contribution to counteracting the market imbalances, which inevitable occur from time to time, could be achieved. In addition, the very presence of such stocks could, we would argue, reduce the speculative ardour of the futures market players by reducing the impact of sudden supply shortfalls or stocks surpluses.

Such innovative approaches to storage offer the opportunity change the current stark division between commercial and strategic stocks, creating a "third way" and bringing inventory management more in line with the current and future market needs. The fact that such arrangements exist and function, demonstrates the feasibility of extending these practices further afield. Such arrangements, moreover, also help to erode the old ideology which regarded producers and consumers as having opposing interests.

We believe therefore that this is an area where there is scope for a more collaborative approach towards stockholding by consumer and producer governments. Companies can take a lead in this by demonstrating that such arrangements have both an economic and strategic rationale.

iii) Increased producer downstream integration

If the world were divided into two camps—crude oil producers and crude oil consumers—then their interests would often be opposed, especially in the short term. To a slight extent, the world looked something like this in the 1970s, with the NOC oil exporters on one side of the fence, and all the buyers of their exports on the other. But it was never really that simple. The IOCs have always been important producers as well as consumers, and many of the NOCs oil-exporters already had their own refineries. The net effect of the rise in oil prices on different companies depended on their position in the market in the value chain from producing down to retailing, and the effects on the integrated companies were mixed.

Since the 1980s there has been an erratic but progressive move by many NOC oil-exporters to expand their downstream operations, both domestically and abroad. Yet even today, the level of integration in all but a few is disproportionately low. Overall, the OPEC members' share of global refining capacity is less than 15% whereas their share of production is more than 40%. This issue has important implications for longer term investment alignment but it also has a bearing on short term market stability.

Companies involved in just one sector of the business will tend to have a preference for prices which best suit their particular area of operations: a refiner will tend to prefer low crude oil prices and high products values, whilst a crude producer would tend to sit on the opposite side of the fence. Integrated operations should thus promote moderation and stability.

In addition, a better understanding of short term demand fluctuations, which today can have an exaggerated price impact, should be gleaned by those involved in the act of selling to the final customer.

1.4 The role of non-fundamentals in price volatility

There is considerable room for debate about what constitute "fundamentals" in today's market. Certainly the supply/demand situation per se did not warrant such large fluctuations in price as we have seen in recent months. But the uncertainty about the outlook for both—particularly the great uncertainty about the future of demand—affects the perspective of buyers and sellers alike. While demand has by no means collapsed, some of the gloom pervading the financial and industrial sectors has now invaded the world of hydrocarbons. Oil shouldn't be at its current price based on the fundamentals; but it's also arguable whether share prices for some of the large industrial companies should be as low as they are, either.

The psychology of the rest of the economy cannot leave oil unaffected and it is legitimate to accept that weakening GDP will affect the sales of oil products, but the speed and manner in which the price collapsed last year, ahead of the actual slowdown in demand, suggests it is more than "economics" leading prices. It is thus debateable how much of the recent price drop is attributable to legitimate scepticism about the world economic outlook, and how much is overreaction. Oil is particularly vulnerable to this sort of excessive response since

political uncertainties which are, and have always been, ever present, have the potential to impact on supplies. In any case, it is clear that the futures market is the mechanism by which concerns are transmitted to real-world prices, and without its enhanced presence in the oil market, it is highly doubtful whether the price reaction would have been as swift or severe.

1.5 The increasing role of paper oil market and its impact on the industry

Since the futures market in crude began in the early 1980s, it has assumed an increasing role in determining the sales prices of crudes and some products, around the world; one or another futures price is included (sometimes indirectly) in most oil contracts. Until the most recent price spike and collapse, the growth in the trading of futures contracts was substantial, running near to 10% per annum since 1990, while oil demand grew at a rate of about 1.4% over the same period. Most recently, the level of futures trading activity has diminished somewhat—most likely temporarily though, more as a result of serious losses on the part of some speculators, the squeeze on investment capital in depleted portfolios and of course reduced liquidity as a result of the banking crisis. Despite this, the general level of activity has still remained high by historic standards.

Many of the assessments undertaken to try and explain recent price volatility concentrated on the futures market players and in particular the more speculative element within this. Such participants will inevitably be attracted to a commodity market which demonstrates a capability of extensive and rapid price movement and where there is widespread ease of access and a whole range of derivative trading mechanisms available. In addition, many non-oil companies for a time were using oil futures to "cross-hedge" exposures in other kind of contracts.

Although it has proved difficult to assess exactly who is "leading" and who is "following" prices in this environment, it seems evident that the substantive increase in positions taken on the futures market by the so-called "non-commercials" would at the very least add velocity to price movement and provide a highly sensitive "hair-trigger", provoking sometimes violent sudden movements.

It thus appears that the oil futures market is now regarded in a similar way to other traded commodity markets as far as "speculative" investors are concerned. The potential trading range now established in oil will continue to attract such players with the clear implication that the oil market will potentially continue to be prone to periods of intense volatility resulting from a speculatively-driven trading mentality.

Although we can expect a tightening in regulations governing a wide range of futures and financial trading activities in the wake of the banking crisis, certain key characteristics of the oil market, such as its susceptibility to a wide range of political developments, the intrinsic cyclicality in the business and the inherent uncertainties over demand and supply, will inevitably appear attractive to "outside" investors. Moreover, whatever tightening of regulations emerges from the banking crisis, fluid and accessible commodity markets are an integral part of the modern international economic system and will not disappear.

However uncomfortable NOCs and IOCs are with this environment, there is very little they can do directly to counteract it. There are, nevertheless, ways in which some of the elements

which feed speculative trading activity can be counterbalanced through stronger inter company co-operation.

1.6. Improving market transparency: what more can be done?

There is no doubt that speculative trading activity thrives in a climate of opaque market information. This allows scope for a wide range of unpredictable factors, linked sometimes tenuously with the actual oil market, to influence price direction. The oil industry suffers in particular from the enormous disparity between price information and that of oil supply/demand. Electronic availability of real time price movements are readily available for a wide range of crude oil and products yet information on oil demand and current production levels is generally either late or not available at all. This imbalance encourages the expansion of sophisticated trading mechanisms but without the commensurate improvement in real market information, further distorting the lop-sided base on which many perceptions about future oil prices are formed.

There has been a growing awareness of the importance of this lack of information, especially as the centre of gravity of oil demand has shifted inexorably away from the industrialised countries towards the emerging markets. Concerted attempts have thus been made in recent years to improve the availability of fundamental data, most notably with the launching of the Joint Oil Data Initiative (JODI) coordinated by the IEF (with the participation of APEC, Eurostat, IEA, OLADE OPEC and UNSD), and the improvement in IEA historical demand statistics. Yet meaningful information for some of the most important countries is either missing or below expected standards. These missing key elements in the demand/supply equation lead to a proliferation of, sometimes highly misleading, estimates to fill the gap, which provide basing points for traders to play off. During the 11th IEF and the Jeddah Energy meeting, while supporting JODI, Ministers suggested extending the Joint Data Initiative to cover natural gas, in order to further improve market transparency and stability.

Although inter-government cooperation is critical in this area, since demand/supply statistics are collated at national level, the oil industry itself has a major potential role to play. Not only are oil companies ultimately the source of such data, they are also vital in the dissemination and use of such data. NOCs have a particularly important role to play in this since they have much of this information within their systems. Collating this information with a view to creating meaningful aggregated statistics should be an attainable goal which could be achieved by a fresh approach, bypassing the bottlenecks of governmental collection and processing of such information.

We would therefore recommend that joint NOC/IOC efforts to explore new ways of circumventing the existing impediments to greater availability of accurate timely data on the fundamentals of the oil market, through greater exchanges of such information a start could be made by identifying the key areas of data deficiency.

2. Ensuring adequate investment

The recent slump in oil prices has dramatically reduced oil company profitability, as well as government revenues in oil exporting countries. This is restricting funds for investment—and, at the same time, lower prices have rendered many new oil and gas development projects uneconomic. These problems are compounded by the international banking crisis and the drop in share prices around the world, which has severely limited the availability of capital,

even from sovereign funds. The smaller E&P companies, who traditionally rely on borrowed capital for funding their projects, are particularly hard hit, but reduced spending plans have also been announced by some larger IOCs and NOCs.

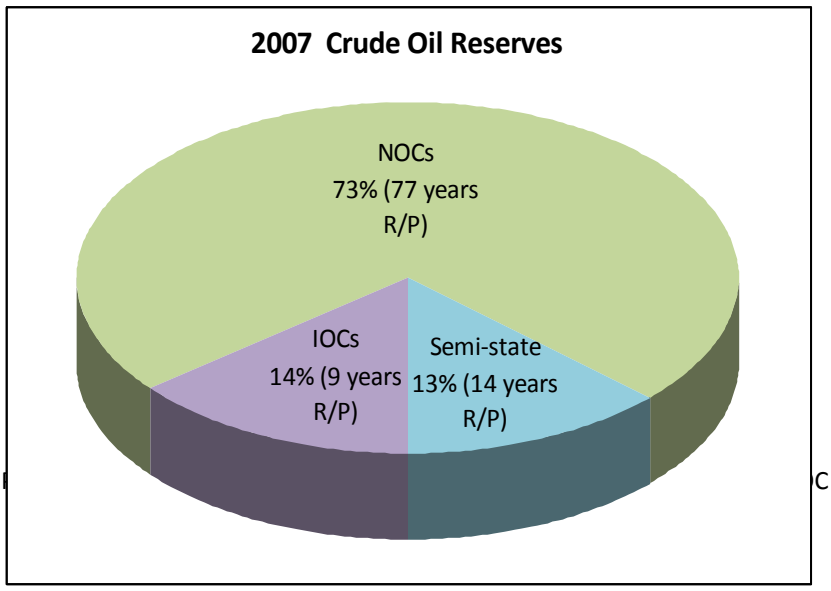
This may act to reduce E&P and downstream construction costs, as in recent years the demand for equipment and services has exceeded the supply. True, oil demand has weakened in response to the economic recession, but demand has a shorter lead-time that supply. A relatively rapid recovery in oil demand could be seen once the recession has passed, but the supply side will take much longer to react to any recovery in spending.

Although we face great near-term uncertainty about almost everything—supply, demand, and prices—there is little question that over the longer term it will become more difficult and more costly to provide sufficient supplies to keep pace with demand. Recent estimates by the IEA indicate that the industry will need to spend about $350 billion each year through 2030 to maintain market balance. This level of investment is needed not only to develop new fields, but also to counteract accelerating decline rates in existing oilfields. On the basis of an extensive study the IEA concluded that the current industry-wide decline rate is averaging 6.7% pa but this will rise to 8.6% by 2030. To prevent even greater increases in decline rates will require substantive investments and the application of increasingly sophisticated technology.

Since many of the IOCs and consumer NOCs have for some time been under strong pressure to maximise production from fields in their declining phase, they have developed sophisticated techniques to maximise yields whilst at the same time minimising the costs of doing so. Ways to utilise these skills in the areas where they can produce the best results could thus be explored with the aim of enhancing recovery factors in the most efficient way.

Since the oil crises of the 1970s, a disproportionately large part of international E&P expenditure has been focused in areas that contained a minority of global reserves. A huge volume of investment has gone to expensive frontier areas, either in newer producers or in difficult offshore regimes. In many ways, the world supply situation has come back to the same basic outlook seen in the 1970s: the bulk of the proven and likely reserves are concentrated in a handful of countries, and prospects elsewhere are generally limited and much more expensive.

In effect the E&P funding has not been directed to where the oil is, and for decades priority has been given to producing the world's most expensive reserves first, and calling on the world's cheapest reserves last.



As the chart here shows, the largest part of remaining oil reserves are concentrated in the hands of NOCs. Although the reserve-to-production (R/P) ratio has its limitations, by any indicator it is clear that the NOCs will increasingly be responsible for supplying the incremental barrel in

coming years. For the producer NOCs, funds raised from oil and gas production represent a major part of government revenue, and there are competing claims on these by needed investments in economic infrastructure, state-funded construction, social programs, and many other uses. While revenues may plummet when oil prices drop, it is much harder to cut back on such expenditures. Investment in oil production in times of low prices is not always a major priority on the government's list.

We are thus faced with a situation where the whole future investment climate in the oil industry has become subject to intensified uncertainty as a result of:

- Structural shifts towards a narrow range of reserve holders;
- The increasing technological complexity of adding new production, not only for new developments but also in terms of stretching the life of existing fields,
- The apparent underlying rising cost base on the upstream side – exacerbated recently by shortages of equipment and skills;
- Heightened uncertainty over future oil demand and prices.

Major new challenges to the industry are thus being thrown up by this combination of factors which call for new approaches to some of the traditional relationships.

2.1 Impact of the current global economic slowdown on investment

Although some of the larger IOCs have built up substantial cash reserves in recent years, generally, most large–scale energy projects are funded by "project financing," where the lender—typically a consortium—provides capital, not to a single borrower, but rather to a project that is deemed to have good economics even after servicing the debt. Project financing, especially when governments hold a share in the project, is undertaken for many reasons, including transparency, third-party scrutiny, and leveraging of equity to obtain higher returns.

It is worth noting that even in oil-exporting nations in the Middle East, such as Saudi Arabia, Qatar, or the UAE, project finance is a normal approach to providing cash for energy developments. And, even in these oil-rich countries, the credit crunch has put many energy projects in jeopardy. Some projects have been delayed or sent back for review whilst many banks are taking a wait-and-see attitude towards loan provision. With uncertainties about future prices and future levels of demand as well as interest, inflation, and currency risks, banks are more reluctant to go ahead with project financing, and when projects do proceed, the risk is usually being spread across a wider range of players.

The credit crunch is real. Banks have written off so much in bad loans that even additional borrowing is not bringing their liquidity up to previous levels; only three-quarters of the write-downs have been covered by new injections of capital. Both the IMF and the Bank of International Settlements (BIS) warn that the problems in the banking industry are more deep-seated than the failure of US subprime mortgages alone. The IMF sees the potential of a continuing vicious circle in the interaction between the banking sector and the general world economy, with tightening credit forestalling much needed investment, especially in developing economies.

The IMF and BIS suggest that the banking crisis could take several years to be resolved; and there is mounting evidence that the availability of capital is indeed a direct barrier to building many energy projects. Governments, moreover, cannot be expected to intervene to help such

projects, either through direct loans or through guarantees. In an environment of low oil prices, diminished demand and surplus capacity, throughout the value chain, energy projects are unlikely to be seen as priority targets for government support or funds.

Early in the banking crisis, some suggested that Sovereign Wealth Funds (SWFs) might be a logical source for project financing. While this may have merit in some circumstances, the SWFs have also seen the values of their portfolios dwindle as well. No financial institution has been immune from the current problems; and no industry is walled off from the problems of the general economy.

Some oil companies, mainly those with large cash reserves, have made bold decisions to maintain capital expenditure for now, but many smaller operators and NOCs, have little choice but to cut back. Whilst the economic recession and the banking crisis, which seem intractably linked, continue, it appears inevitable that investments in all sectors of the oil industry will be curtailed. If oil companies collectively emphasise the danger this creates in terms of the unavoidable impact on future supplies, and the potential consequences of this, the prospects of boosting investments as early as possible in the recovery cycle (and if necessary before the revival in oil prices), will be much improved. This is all the more pertinent when one considers that governments in some of the industrialised countries, now own large sectors of the banking community.

2.2. Increased complexity and risk of investment projects

From an economist's perspective, the effect of the credit crunch is to *raise the price of risk*. And risks have done nothing but multiply during the financial crisis, with the collapse in oil prices magnifying uncertainty. Coupled with this are the added risks generated by governments still struggling to formulate cohesive and effective policies on carbon. The combination provides an unacceptable cocktail of risk on which investments in this sector have to be undertaken.

Yet, no one believes the market for oil is diminishing in the foreseeable future and investments must therefore to be forthcoming.

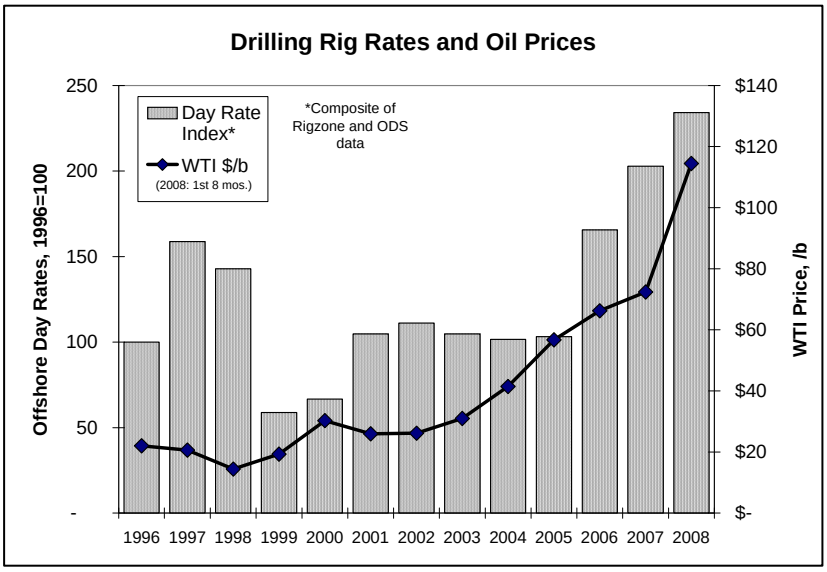
Oil and the other energy industries, moreover, face the problem of sheer scale. As the economies of scale drive project size upwards the capital cost also rises. This applies equally to the up and downstream as well as unconventional oil development.

As the complexity, risk and capital requirements of development projects rise, the ability of individual companies, whether NOCs or IOCs, to tackle such ventures alone diminishes and the appeal of risk and cost spreading through partnerships increases.

2.3. Cost trends and service companies

The effect of increased oil prices on energy-intensive commodities such as steel and metals used in the construction industry are not negligible, but the dominant determinant of construction and exploration costs seems to be the availability of equipment and expertise. As in previous oil-price shocks, general commodity prices chased the oil prices upwards; and, as

seen in previous shocks, there are already signs that those commodity prices are beginning to soften.



Nonetheless, the jumps in costs are real and substantial. The chart here shows the day rate—the daily charge for leasing a rig—for worldwide offshore drilling. Since 2005, the cost of leasing a drilling rig has more than doubled; for specialized deep-water rigs, the increases are even larger.

The cost of building a drilling rig is not the dominant factor in the day rates. Instead, the perception of the future of oil prices determines how much demand there is for drilling. When the Asian Financial Crisis hit in 1997, demand for rigs was high, but as the oil price slumped, so did drilling. With the price of Dubai crude dipping to $10/b, few companies were enthusiastic about finding oil—even when prices began to revive. When prices surged after 2004, the industry didn't have the human capital or the rigs to respond to the increased demand for E&P. In the current environment it isn't clear if the capacity expansion will continue at the needed rate to meet future needs.

Increases in construction costs in other areas of hydrocarbon processing, however, have been even larger than those seen in E&P. In refining, chemicals, and related areas, reported costs since 2005 in some cases have jumped by three to five times. Coupled with credit issues, it isn't surprising that many gas and oil processing projects are being deferred.

But the tightness in downstream engineering resources was probably a temporary squeeze. The jump in oil prices happened to come at a time when a massive number of processing projects were already underway around the world. Five major factors affected the availability of chemical-engineering construction services in 2005-2008:

- Large expansions of refining, especially in Asia and the Middle East
- Increased petrochemical capacity, both primary and secondary
- Nonconventional oil projects gearing up, especially in Canada
- Gas-to-Liquids (GTL) projects in the Middle East and Africa
- Qatar's massive gas, condensate, and LNG development.

None of these will permanently employ the engineers, contractors, and heavy industrial plant presently at work. Surpluses in refining and petrochemicals loom in the near future, and many projects have been quietly shelved. Nonconventional oil projects in Canada and elsewhere are rethinking their expansions based on higher construction costs. There are no firm GTL projects beyond those under construction, and the unprecedented Qatari industrial expansion will reach completion by 2012. The surge in costs in recent years is largely explained by insufficient engineering resources, spread over too many projects.

A concern today is whether, in light of the cutback in projects, the major engineering and construction firms will maintain their capacity until it is needed again, or if economic pressures will force them to pare staff and close facilities – thus creating the seeds of the next cost escalation. Part of this is unavoidable, given the cyclical nature of high capital-intensive businesses, but part is due to the disparate structure of the industry. Many of the key industries are far removed from the core investment drivers and have little knowledge of future expansion plans until tenders are put out for construction or supplies. Better communication between the large companies, whether they are NOCs or IOCs and smaller support industries should be attainable and improved co-ordination of investments through the different layers of the business could result.

The so-called Service companies fall within this general description but some have grown to a size where they are effectively hybrid IOCs, whilst at the same time establishing close working relationships with a wide range of NOCs. Since they do not seek equity interests they are more ready to work under terms which are often more acceptable to some producer NOCs. Yet they are not oil companies and so do not take risks in exploration acreage. Their function therefore is very specific and they are hired as contractors.

Whilst the larger of the service companies are well known internationally, there are numerous smaller, more narrowly specialised companies which have emerged from the North American, North Sea and more recently Middle East upstream, which represent pool of technical expertise.

These companies in particular, however, are vulnerable to the current operating environment of low oil prices and reduced investments, relying as they do on ongoing contracts. Efforts could be made to utilise these smaller service companies on a more continuous basis by identifying their particular skills and incorporating these into project planning.

IOCs and NOCs need to devise systems where there is stability in relationships and no major push for renegotiations when market conditions change. Stability is the key to long-term investment. In certain countries service contract are very specifically defined. The Kuwaiti model added certain incentives for the upstream investors in terms of the ROR, and the new Iran buy-backs have improved the terms substantially. There is much here to be learnt from the experience of the different players and there is great value in sharing knowledge in terms of the generalities of the structure of the contracts.

2.4 Skills shortage in the industry

The cost increases in E&P and construction in recent years are not only the result of the shortage of rigs and industrial capacity; there is also a shortage of skilled operators and engineers. In the price booms, colleges and governments encourage students to rush into petroleum engineering, and companies expand their own training programs.

Unfortunately, when prices slump, the reverse is true with companies often quick to cut staff (especially in the OECD countries) and training budgets. The high average age of such workers often means that retirement follows, whilst younger employees will often find work in other industries.

This is another disconnect between the short-term outlook and the longer-term problem. More skilled workers will be needed in the future, not less; but, for companies responsible to

their stockholders, there will be a strong incentive to lay off staff or at least discourage new hiring.

Part of the problem arises from the fact that there are fewer large IOCs, which traditionally provided a significant part of the global industry's requirement and as a consequence there are less students entering North American and European universities with careers in the oil industry in mind. Although there have been enormous advances in some of the oil exporting countries' training facilities this is another example of the handicap of long lead times.

Yet the international industry can ill-afford to lose its skilled workforce. A more co-operative approach to the problem between IOCs and NOCs might prevent some of the loss to the industry. Stronger links between the NOCs in particular and educational and training institutions, which some companies are already pursuing (StatoilHydro and UC Berkeley for example) could also be developed. This is another area where greater governmental involvement could also be beneficial.

2.5 How is investment in clean energy technologies affected?

The financial crisis and drop in oil prices has created an environment where there is not only a general shortage of capital for new investment, but no one is certain about near-term prices—much less the amortization of finance over the 15-30 year project life of most major undertakings.

This, moreover, is being compounded by uncertainties over government policies on environment and climate change which are impacting in particular on investments in many of the clean-energy technologies. Despite sponsorship from governments, low energy prices pose serious problems for alternative energy projects, which are characterized by low operating costs but high upfront capital costs. Even in more conventional alternatives, such as biofuels, low oil prices and high feed costs combined with shortages of capital have already closed or forced consolidation of many companies.

2.6 Ways and means to align upstream and downstream investment to avoid market imbalances

The oil industry has long had tradition of integrated investment but in recent decades this process has been intermittent and unevenly spread. The extent to which barriers have prevented more closely linked up and downstream investments have been the subject of considerable bilateral discussion between companies and between governments. There have also been multilateral examinations of 'harmonization' by organizations such as ASEAN.

This need for greater co-operation on the downstream is perhaps more urgent now that in the past. The current environment in the refining sector is characterised by many of the long established IOCs seeking to rationalise their downstream operations, whereas consumer NOCs are investing heavily in new capacity to meet anticipated local demand growth, but without secure sources of feedstock, and some of the producer NOCs are planning to expand export orientated refineries, based in their own countries.

This suggests that there is a counterbalancing pattern of needs and desires in the global refining business, which calls for greater integration by producers and an increase in collaborative ownership and operatorship of refineries between the different company types. Such arrangements have been a long tradition of the oil industry yet the scale of this appears inadequate to meet the challenges ahead. Models exist, moreover, based on mutual dependence and supply security, which can provide blueprints for further collaboration. Such examples are:

i) The Saudi, joint venture approach where Saudi Aramco guarantees crude supplies and co-owns and operates refineries in both overseas markets and with export-orientated plants at home: with ExxonMobil and Sinopec at Fujian, China; with Shell in Show Shell Japan; with S Oil in Korea with Shell at Motiva in the USA; with Shell and ExxonMobil in Saudi Arabia, with plans for new JVs with Total and ConocoPhillps.

ii) The Kuwait model, which involves both complete ownership, including retailing operations, as in Europe and new planned JVs with Sinopec in China and with Idemitsu and PetroVietnam in Vietnam.

iii) Abu Dhabi/UAE model involving investment by IPIC (a venture between ADNOC and Abu Dhabi Investment Authority) which includes: an equity stake in the Austrian integrated company OMV and the Spanish Cepsa; a majority interest in Hyundai Oil Bank in Korea; a stake in Cosmo Oil in Abu Dhabi and the provision of finance for the Papua New Guinea LNG project.

iv) The Venezuelan model which includes 100% ownership of Citgo in the USA and 50% (with BP) of Ruhroel in Germany and 50% (with Neste) of the Swedish based AB Nynas.

There is, therefore, a broad experience base on which to draw and a variety of different models to utilise as blue-prints for future co-operative ventures of this sort. They provide different benefits for both the NOCs and IOCs involved but underlying most of the ventures include some or all of the following: enhanced security of supply for consuming countries, guaranteed offtake of crude for the producers, better end-sector market knowledge for crude producers, shared expertise in refining technology and practices, improved relations between producers and consumers.

The challenges confronting the industry currently suggest there is a mutuality of interest between NOCs and IOCs to expand the level of co-operation on the downstream. This would directly strengthen the links between the up and downstream in terms of better balancing investments, stimulate the transfer of refining technology and operations and address the growing concerns over security of both supply and demand. This is an area which would benefit from closer collaboration between NOCs and IOCs, in particular by identifying the barriers to investments, whether they are political or economic, in downstream facilities around the world, and recommend what steps might be taken to improve the investment climate.

2.7 Dealing with environmental and climate change challenges

One of the biggest challenges facing the industry is the environmental impact of dealing with the burning of fossil fuels. Although the problems are not generally as large as those faced by

the coal industry, oil and gas are also facing possible limits on carbon-dioxide emissions as well as increasingly stringent product specifications around the globe.

i) Initiatives on carbon dioxide

Present problems over fundamentals are exacerbated by the additional huge uncertainties over the future policies that will affect greenhouse gas emissions. In the past some companies have tended to see this as a threat but today the bulk of the industry has accepted the importance of this and is seeking ways to identify the opportunities thus created.

In fact, this is a place where industry ought to play an active role in shaping policy. A proactive posture that anticipates needs stands a better chance of producing policies the industry can work with and which contribute towards the global need to counteract climate change.

Fortunately, many companies are tackling the problem of carbon sequestration, and carbon capture which seem to offer particular opportunities for IOC/NOC cooperative ventures. Many of the larger IOCs are investing in the technology and such schemes offer potential benefits to producer NOCs since they can reduce the environmental effects of burning fossil fuels whilst also enabling enhanced recovery at oil and gas fields.

Some such schemes are already underway: In Algeria, the Sonatrach/BP/Statoil In Salah, CO_2 capture and storage joint venture project has been running since 2004 and Abu Dhabi has launched its $3 billion Carbon Capture & Storage (CCS) project (partnered by BP/Rio Tinto), planned for completion in 2013, which will capture CO_2 and use this for enhanced oil recovery as well as potentially providing alternative energy for power and transport. OPEC has also expressed its support for CCS schemes but recognises that funding the technological development of the process is a stumbling block.

ii) Cleaner Fuels

Petroleum product specifications are another area where there is great opportunity for companies to find common ground on an environmental issue and lobby for a sensible approach to change. Since tighter specs often raise costs, this has a clear implication for the industry.

Countries often cause difficulties for themselves by adopting specifications that are out of line with commonly traded products. This is not necessarily a problem of the specifications being too stringent; it is a problem of creating an intermediate grade of product that didn't exist before. The success of the Eurospec levels is an indication of how much can be achieved by creating a ladder of increasingly stringent specifications that a country can climb up as they decide to improve emissions. Many countries across the globe are now setting targets based on the Eurospec levels as benchmarks on which they move towards more environmentally acceptable products specifications.

If this approach—indeed *any* systematic approach with levels of stringency—could become universal, it would make products more fungible and facilitate more efficient international oil trade flows.

There thus seems scope for cooperative discussions aimed at agreeing recommendation aimed at designing a comprehensive package of standardized specifications that can be offered to government policymakers as an alternative to adopting new specifications that may be out of line with industry grades and practices.

3. Increasing extended NOC/IOC partnerships in other areas

The NOCs with the biggest resource bases do not generally have a proportionate share of the investment capital or the engineering resources. While lower prices also provide IOCs with constraints on capital availability, the IOCs have a far smaller variety of calls on their capital. The record of IOCs diversifying into other energy sectors or other industries has generally been poor and by and large, the vast bulk of capital expenditure is directed at the hydrocarbon sector. While the IOCs have major capital and technology advantages, their options for further E&P investments tend to be limited to riskier, higher-cost, and less prospective areas around the world

An unfortunate side effect in many countries, however, is that foreign oil companies are effectively locked out of the nation's oil and gas sector, particularly the upstream part of the business. While this has been good for many of the NOCs, who have transformed themselves into major international businesses, in many cases it also leaves them short of the resources that IOCs, or importing-country NOCs, could bring to upstream joint ventures.

Foreign ownership of resources, or even shares of resources in a given project, is likely to remain out of the question in many countries. Nonetheless, it could prove beneficial if all three types of companies—IOCs, resource-rich NOCs, and oil-importing NOCs—could discuss possible new contractual means for encouraging the investment of outside money and technology in countries presently closed to outside investment. This would apply particularly to utilising the technical skills and experience in enhanced oil recovery and exploration in frontier regions in addition to the exploitation of heavy and high metals and acidic crude oils.

The time is surely ripe for a discussion of innovative joint-venture structures, without violating any of the tenets of national sovereignty and national control. Such joint ventures need not be limited to the upstream sector; indeed, it is possible to imagine an integrated partnership, with joint investment upstream in a producing country and joint investment downstream in a consuming centre.

3.1 - Stability of regulatory and fiscal terms

As mentioned above, one of the problems faced in many cases with foreign investment is that the regulatory and fiscal terms are ultimately decided by the government, and there is often pressure to renegotiate these terms, particularly when market circumstances or the operating environment changes.

In any case, national policies are adopted by governments, and outside companies are not usually called in to make suggestions. Nonetheless, wide-ranging discussions of what works and what does not (as in the monitoring of the structure of service contracts and PSCs recommended above) could be valuable information, and might paint a better picture of how a stable and fair regime could be constructed. This is also a strong argument for joint ventures of IOCs or NOCs with the host-country NOC; a well-constructed joint venture can encourage or even ensure fair and equal treatment.

3.2 - Cross and joint investments

Downstream joint ventures in refining have already been discussed, but it is worth stressing some of the less obvious benefits. Although much attention is directed towards uncertainties on the supply side, the greatest unknown is arguably over future demand levels; production capacity supply is far less volatile and easier to anticipate. But there is no real demand for "oil" *per se*; final demand is for refined products, and the upstream sector touches the demand side of the equation only through the downstream sector.

The companies with the best knowledge of end-user demand are those selling products to the final customers. Yet these companies, the IOCs and the importing NOCs, will not be driving future oil supplies. Closer links between producers and importing country refiner/marketers, should improve knowledge of oil demand trends. Considerations could thus be given to ways of encouraging greater co-ownership of refining capacity combined with more formalised ways of exchanging information on products demand developments and related issues such as changing products specifications.

Apart from integrated upstream/downstream joint ventures, there is also great scope for co-investment and cross-investment in the downstream sector on its own. In a time when capital is limited on all sides, downstream investments that rely wholly or partly on foreign capital should be welcomed.

3.3 - Innovative partnerships and alliances

While there have been plenty of NOC/IOC joint ventures, especially in the downstream sector, there has not yet been a full-fledged 'strategic alliance' between and NOC and an IOC (similar to those seen in high-tech and manufacturing businesses in the US). A strategic alliance goes beyond the performance of joint projects and investments; it involves the sharing of skills, intellectual property, and preferential co-investment. It can include cooperative R&D, or R&D performed by one partner to meet the needs of another. Some US companies actually co-own research laboratories.

Although this concept is now well-known in the high-tech and manufacturing sectors, it is still alien to the world of oil, where partners on one project may be sparring with each other on another one. This is an opportunity for companies to think of innovative and far-reaching ways to cooperate. There is no advantage for two random companies to undertake such a venture, but when two complementary companies form a strategic alliance, it can be a very powerful change.

3.4 - Role of Governments in NOC/IOC Co-operation

Whereas governments can often provide a political umbrella to help encourage dialogue, co-operative ventures between NOCs and IOCs are more likely to be successful if based around commercial opportunities. Governments can also facilitate cooperation by, for example, streamlining or eliminating barriers that make co-investment difficult. Some countries are notorious for the bureaucratic hurdles that must be cleared for a foreign investor to do business, and in many cases these same hurdles remain even if the foreign company is partnering with the NOC.

In some cases, the constraints are on the other side of the equation; some countries have considerable restrictions on the overseas investments that can be made by their own NOCs. Some of these restrictions are sensible but many of the rules and restrictions are hangovers from the 1970s, when so much emphasis was placed on self-sufficiency and independence.

3.5 - Role of governments in reducing market uncertainty

Governments are critical in two areas that dramatically affect market uncertainty. The biggest issue, which was discussed earlier, is in contributing to market transparency.

The benefits of restricted information to the few are far outweighed by the benefits of transparency to everyone else. Governments and intergovernmental agencies are in many ways the most important source of transparency. Comprehensive data like that provided by the IEA or the US Energy Information Administration is used not only by governments and researchers, but is also heavily employed by even the largest of multinational energy companies. Expanding the breadth and depth of energy data sources lowers risk and allows better planning for both buyers and sellers at every level of the energy supply chain.

Ultimately it is the government who decides what information is to be made available from companies operating on its soil. Governments are the only forces who can compel disclosure of data, or cause previously uncompiled data to be collected.

Another great uncertainty, which is also under government control, is environmental policy, especially the issue of carbon management. Policies taxing, capping, or allowing trading of carbon emissions can have dramatic effects on the viability of major hydrocarbon projects, and can change the relative competitiveness of many energy sources.

Governments need to lower the risk of the policymaking side of the equation by adopting policies that are clear, fair, and, above all, sustainable. Encouraging major investments in energy infrastructure and facilities is a disservice to everyone if the incentives are abandoned or reversed at a future date.

Even-handedness is one of the key means for lowering uncertainty. While there is always pressure on government to cherry-pick among possible energy projects, offering special terms, incentives, or exemptions to certain projects makes the investment process seem too political to be trusted. The beneficiaries of these sorts of distortions will of course speak out in favour of this behaviour, but it sends the wrong signals to other players in the industry.

3.6 - Cooperation between NOCs and IOCs on environmental issues

As discussed in the earlier section on the environment, the oil industry as a whole could have an important role to perform in helping to shape environmental policy. As emphasized, technological solutions are likely to play an important role in matters such as limiting carbon emissions, and we have already cited important instances of NOC/IOC partnership in carbon capture and sequestrations.

Important as technology in managing carbon, however, the economic side of the equation cannot be ignored; caps and/or taxes are certainly on the horizon. Despite the fact that carbon dioxide emissions are truly a global problem, many countries have become frustrated with the pace of action at international level and are adopting their own national or regional regulations.

Policies adopted by a government without international coordination may have unanticipated or even perverse effects. For instance, if a project is driven overseas by a national carbon policy, there is no net benefit to the global climate, and not even any benefit to the local environment. Even more problematic is the issue of “system boundaries.” As a number of

observers have noted, mining coal typically has a lower carbon load than liquefying natural gas. If both are aimed at the export market, then, perversely, national carbon controls will encourage the export of coal and discourage the export of LNG—even though from a global perspective it ought to be the other way around.

Of course, this perverse effect would not exist if there were emission taxes and emission-trading schemes operating worldwide: the effects not captured at the source would be paid for at the point of consumption. But unless more comprehensive agreements are reached on transnational carbon controls there are dangers that national schemes will have very different effects than intended. Cross-border trading of carbon emissions is vital if sensible policies are to be adopted.

There would thus appear to be scope for NOCs and IOCs to discuss and attempt to influence a realistic consensus approach to managing carbon emissions, both technically and in terms of economic policy; the alternative is to have less practicable schemes imposed upon the industry.

4. Conclusion

There are no simple solutions to many of the problems facing the industry today. The financial crisis is bad for everyone and no individual company, whether they are NOCs or IOCs can counteract the problems. Nor can prices and demand be controlled by companies, and although some potentially have considerable control over their oil supply, creating and holding spare capacity faces big economic and political hurdles. Carbon management also presents many uncertainties and imponderables, and the scale of the challenges the industry faces on this front are unprecedented.

Although companies cannot solve all of the problems, they can accomplish more working together than working at cross-purposes; and, in cases where something like an industry consensus can be presented; there are opportunities for affecting government policy formulation.

For many years the IOCs and NOCs have been viewed as opposing forces. The changes over the last two decades, however, have made them more alike than different in many ways; numerous NOCs are now major investors on an international basis, and all parties are now more commercially orientated and have an increased market orientation. All companies in this sector also have a responsibility towards the growing environmental problems. Companies will still disagree on many issues, but the old established boundaries are becoming blurred and there are many issues which can be better served by new consensus emerging, which can only be achieved through greater dialogue, debate and discussion amongst the whole industry.
