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This is the 60th issue of *Oxford Energy Forum*. You will find its content somewhat different to what you are accustomed. In place of two 'debates', a separate article and a Personal Commentary, we have seven articles covering different aspects of the energy scene. We think that they will, each in its own way, give some idea of the changes that have occurred during the life of Forum. There are, of course, many other aspects of change that we might have addressed and which we will hope to look at in subsequent issues.

The first issue of Forum was in the spring of 1990, a few months before the Iraqi invasion of Kuwait. While we may be able to recall that momentous event with comparative clarity, most of us will probably remember only hazily what was then taking place in the energy world at large. Nor is it probably of much importance now except to the historians. Nevertheless, it provides something of a peg from which to hang this collection of articles, for which we are particularly grateful to the authors.

That old chestnut, Energy Policy, has been bandied about for far longer than Forum has been in existence but usually manages to seem heavy with re-cycled lists of fine sentiments and calls to action that can be conveniently shelved until next time. John Mitchell has picked up the files and given them a good shake. With luck the bureaucrats will resist their urge to sweep up the fallen dust and re-use it yet again, and, rather, be encouraged to concentrate on Mitchell's analysis.

Bernard Bulkin has blown a triumphal trumpet call for Technology. He reminds us of some of the things it has achieved in the last fifteen years and looks forward to its breaking even more exciting barriers in the next fifteen. And don't forget, he reminds us, that new research successes will emerge from a far wider base than in the past – China, for instance, Russia, India, Brazil and who knows where else.

Antonio Merino looks back to the broad lines of OPEC development and reasons that adaptation to changing conditions is the only constant to be found. At times the adaptation has reflected positive

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action, at others it has been reactive. If it is correct that we are now at a fresh corner on the long road of supply/demand balance, OPEC needs soon to show whether it will this time take a positive line in its adaptive process or, having been blown off course, find itself grappling with new uncertainties.

Robert Arnott gives us a succinct survey of the way in which the companies have reacted to violent changes in the financial and operating environment of the past fifteen years or so. Cost-cutting, investment, reserve replacement, investor scrutiny and oil price have battered the companies and will, no doubt, continue to do so. Today, the buzz-word may be 'access', but what will it be tomorrow?

Paul Newman represents the modern face of the oil market, where derivatives, price swaps, swaptions and other esoteric mechanisms underlie the prices ultimately paid by the motorist at the pump or the householder at the boiler. As he says, the price swap market now for the first time shows us a long-term curve shape to price. Soon we shall all, perhaps, know the price of oil without OPEC trying to tell us otherwise.

North East Asia seems to be developing, if it hasn't already developed, as the power house of energy consumption. Philip Andrews-Speed, Xuanli Liao and Paul Stevens look at one particular aspect of how the future may evolve in this important region. Can energy cooperation between the individual countries help their overall development and, indeed, prevent destructive competition, and, if so, through what institutions? They conclude that the outlook is not particularly auspicious, but can we say with any confidence that we have any examples to offer them?

Then there is North America. What can we expect from that direction? Edward Morse looks back at the way in which Government has been edged out, or has edged itself out, of policy, largely through the processes of market liberalisation. Now that prices are on the increase, questions are again being asked as to what part government should, or will, play. He suggests that action will finally have to be taken to deal with the problem of ever-increasing automotive fuel consumption, and sees, as the most surprising current development, the convergence of the political left and right in what he calls Green Conservatism.

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Energy Policy: Old Baggage

John Mitchell

The concept of Energy Policy, developed in the OECD in the 1970s, is now of little use and should be discarded. The policies which affect the energy sector can be better understood under the broader heading of *energy governance*. The energy sector today is governed not only by governments (and certainly not only by OECD governments) but also by business self-government, non-governmental organisations and investors. Their objectives are driven from outside the energy sector, by policies on economic reform, protection of human health and natural ecosystems (including the climate) and the development objectives endorsed at the World Summit on Sustainable Development.

1970s energy policies were a response to deep changes of which the oil crisis of 1973 was a spectacular symptom. For most OECD countries, demand for energy had outgrown their domestic supply. The USA had begun to import oil. OECD oil companies competed to exploit and export cheap foreign oil from countries where they enjoyed concessions. At the beginning of the 1970s 'Energy Policy' in the OECD countries largely consisted in the acceptance of this shift to imports. The concerns of the exporting countries had received little attention but it was they who upset the premise of access to cheap oil on which the acceptance of imports had been based. As British and French influence in the Middle East and Africa declined, the governments there progressively asserted their sovereignty. The oil companies were excluded from price setting after 1973, and their concessions were nationalised. The OECD countries responded to the first oil shock with energy policies which focused on reducing import dependence, and set up the IEA to counter the supposed power of OPEC. The second oil shock ended the special role of international oil companies in marketing most of OPEC oil. The international oil commodity market, as we know it today, came into existence. The price explosion of 1979–80 turned out to be more effective than the 1970s OECD policies in stimulating non-OPEC supply, and reducing the demand for oil. Market forces appeared to be looking after OECD interests and the collapse of the oil price in 1986 took Energy Policy down the OECD agenda.

The 1980s saw the governance of energy driven by other priorities. The OECD countries were dismantling the 'mixed economies' of price controls, economic planning and state ownership (in Europe), regulation (in North America). State industries were privatised and price controls and regulation were removed from energy as from other sectors. The 1990s saw Russia and China in different ways following economic reforms in the same general direction.

> "A 'liberalised' market structure does not reward the carrying of strategic inventories or spare capacity"

When the oil price surged in Summer 2000, OECD governments and the European Commission brought out their files and reviewed their energy policies. Typical 'energy policy' post-2000 objectives talk about reliable, affordable, and environmentally sound energy supplies (US Energy Plan, 2001); Security of supply, competitiveness, and protection of the environment (European Parliament, 2001); Energy security, environmental protection and economic efficiency (Japan, 2001) but are light on specifics, except where special interests have gained a place – as in the US Energy Bill (not yet enacted). There are several reasons for this lack of content.

The role of government has changed. Energy policies in the OECD today cannot be grounded – as they were in the 1970s – in active government management by price controls, quotas, subsidies or investment planning. Regulation has increased, but it is directed at reducing the impacts of energy production and consumption on health and the natural environment (including the climate) rather than at the energy activities themselves. Far more than before, the governance of the sector involves non-government agencies, public opinion, consumers and investors, and 'self-government' through voluntary agreements. These bring wider concerns: social impacts, human rights, and the development of countries outside the OECD.

The importance of international petroleum trade is irreversible. Petroleum resources are distributed by geology, not by the propensity to consume. The economic benefits of trade are still enormous. Energy 'efficiency' programmes have an (unsubsidised) place, but there is no pretence that 'energy independence' is possible for the OECD collectively or for any but one or two of its members.

The OECD policy documents talk – without many specifics – about building relationships with exporting countries. The 9th International Energy Forum in May 2004, went a little further, talking of fair prices, but also commending price stability. The contradiction is that competitive markets may be fair and efficient – with open access and transparency – but prices may be unstable in the short term – because that is how commodity markets work. Price stability requires the existence of spare capacity at every stage of the supply chain and some mechanism to manage it. Only OPEC tries to do this.

OECD policies also talk about diversification of sources of imports. This requires a large and continuous flow of investment into energy export projects in non-OECD countries. The Energy Charter Treaty aims to get security for such investments by foreign (mainly OECD) private sector companies but the Treaty has not been ratified by many exporters. The Treaty, like most bilateral investment treaties, does not involve OECD governments in social and developmental concerns. These are, however, part of the new governance

of energy because of their place in the financial community's commitments to the 'Equator Principles', in major international companies' commitments to the UN Secretary-General's 'Global Compact', and in processes such as the World Bank's Extractive Industries Review.

'Energy Security' is ambiguous. In today's competitive domestic energy markets it means continuity of supply for final consumers. In the gas and electricity sectors, there can be disruptions which no price can cure in the short term. A 'liberalised' market structure does not reward the carrying of strategic inventories or spare capacity. The risk of such domestic disruptions has been shifted to consumers.

In the 1970s, 'Energy security' meant security of imports from political disruption, and this concept is still invoked, though since 1973 all political sanctions on energy have been imposed by importers, such as the USA, on exporters, such as Iran, Libya, Iraq, Sudan, Myanmar, and so on. These demonstrate that energy sanctions are important only where there is a wider security confrontation. No exporter – even Russia – is in a position to challenge the USA or NATO members militarily, and none can make up for its lack of military and diplomatic power by an oil or gas weapon. The exceptional case is, as in 1973, the vulnerability of Israel and the resulting implication of the United States.

The headline energy policy objectives are not necessarily coherent. 'Reducing import dependence' – the old slogan – has no systematic relationship with the climate change objectives with which the EU and UK policy documents are crammed: domestic energy may emit more or less greenhouse gases than imports. The principle of 'Internalising external costs' gives way to politics in the negotiation of cap-and-trade emissions allocations in the EU, in energy taxes which are not related to emissions – and in most European taxes on transport fuel.

Most OECD current energy policies avoid hard conclusions on nuclear energy with its environmental benefits, and risks, uncertain standard economics, and links to proliferation and military issues.

So what to do? The first step is to think more clearly. We should unpack the old suitcase of energy policy, sift out the clichés, the green packaging, and the special pleading, and connect the real objectives with their drivers outside the energy sector. Energy security should be deconstructed into reliability at the last stage before the consumer – mainly a local issue; reliability and diversity of international infrastructures; and genuine national security and foreign policy issues.

Tracking policies to their sources would not diminish the responsibility of energy ministries, energy producing and consuming enterprises and energy experts for integrating the policies and reconciling them with technical and economic realities.

The next step would be to recognise the broad nature of energy governance, to connect more clearly with

- The developing international relationships between the OECD, the developing countries, and the petroleum exporters, not just in the WTO, which most petroleum exporters have now joined or are seeking to join, but in the growing networks of bilateral and regional agreements and in global negotiations on climate policy and sustainable development.
- The inter-sectoral efforts to develop sustainable technologies of consumption. These directly involve business – and not only energy businesses. Examples are the European Commission's auto-oil programme (now copied in China and India), the US and IEA support of R&D for relevant technologies, and the 'Mobility' initiative of the World Business Council for Sustainable Development. Business involvement can make frontiers and sector boundaries easier to cross than can government bureaucracies.
- The need for continual acceptance and re-acceptance by civil society of the energy production and consumption activities. The nuclear question is central to this.

The old energy policy portmanteau was carried along by the slowly changing dependence of economic growth on increasing energy consumption and the consequent need for supply. Neither the natural resources nor the natural environment of the world can sustain this path of growth as the numbers projected for China and India take effect.

A new approach to energy governance requires a different coordinating principle. Government commitments to Sustainable Development are wordy, vague, and often contradictory, but are much more far-reaching than the traditional exhortations for 'win-win' energy efficiency or the emission reduction targets of the Kyoto Protocol. The connections between transport and economic development, and between electrification and economic development, have to be rethought and then reformed to enable human welfare to grow without unacceptable damage to the natural environment and the interests of future generations by the consumption and production of energy.

Technology and Energy – 21St Century Outlook

Bernard J. Bulkin

For the past 150 years of energy production and consumption, technology has always exceeded our expectations. Sure, there have been some things that were speculated on thirty years ago as coming soon, and which have still not appeared, but this is probably less a failure of technology development than of speculation. And there is very little reason to believe that the next 150 years will be any different.

This paper will talk in more detail about various primary energy sources,

and their technological prospects, and several aspects of demand for energy, where new technology can have an impact. Broadly, there are four things driving change in energy technology:

- Environment – growing worldwide concern about climate change, continuing concerns about local air, water, and land quality, and regulatory pressures on all of these areas. It has been well established by Michael Porter and Claas Van Der Linde that if one sets the regulatory bar high, and leaves sufficient time to comply, then new technology will come to market allowing compliance with high standards at much lower cost than anticipated.
- Price – the sustained period of high oil and gas prices is likely to lead to stronger research budgets across a range of technological problems, as well as making it easier for new technological alternatives to be economically persuasive in the market.
- Security of supply – continuing concerns drive the development of new technology to enable diversification of supply sources, and, for big consumers (USA, China, Japan, India) to enable domestic sources of primary energy to take a bigger share, without compromising environmental standards.
- Cultural change – consumers are changing, and demanding that companies respond to their expectations on environment, price, and choice. New technologies will be developed to allow companies to win market share.

Now it has to be said that not everyone agrees with this optimistic outlook for technology. Mayer Hillman, a leading UK thinker on energy and environment, has taken a very opposite view in a recent book, *How We Can Save the Planet.* He argues that 'technology is highly unlikely to be able to reduce carbon dioxide emissions sufficiently… to avoid serious damage to the planet'. Rather, he argues, 'Major changes to our lifestyles will be necessary'. He goes on to argue that in the UK the average household must, over the next fifty years, reduce its CO_2 emissions through lifestyle changes to below 20% of today's level. His chapter on the role of technology he calls 'Wishful Thinking'. Hillman looks at the three broad areas of energy efficiency, less carbon intensive or zero carbon energy sources, and carbon capture and sequestration, asking whether they can collectively make sufficient impact. His arguments are flawed in that they really try to show that any one of the individual technologies will not solve the problem, from which he argues that they cannot solve the problem in aggregate either.

A much more sophisticated approach has been put forward in a recent paper by Steven Pacala and Robert Socolow, accepting that no one thing will solve the carbon problem, but that there are possibilities for half a dozen big things to make sufficient impact.

"we can expect order of magnitude improvements in the ratio of efficiency/cost for photovoltaics"

Before looking to the future, it is worth highlighting a few fairly recent responses to signals similar to those we are seeing today. Between 1973 and 1980 the fuel economy of the car fleets in the USA and Europe approximately doubled. And while there has been some loss of fuel economy in recent years because of increased sale of light trucks, most of the gains are still with us thirty years later. Moreover, to meet the demand for improved urban air quality, technology in fuels, combustion, engine management, and after-treatment has reduced emissions by 99% over the same period, and further reductions will occur in the next few years. While we might have anticipated some of these, the impact of the development and application of information technology to vehicles has gone far beyond anyone's speculation.

White goods have become much more efficient. A study by the US Department of Energy showed that the energy efficiency of refrigerators has increased by 300% in the past thirty years. Coupled with better labelling, this has led to major changes in consumer purchasing behaviour. As a result, all manufacturers have been forced to come up to the higher standard.

And further up the chain, the progress in finding oil and gas, and in producing it more cheaply, has been spectacular. As a result of technology such as horizontal drilling and multilateral wells, oil fields that were uneconomic at $30 per barrel when discovered 25 years ago are now being produced with good returns at prices above $14 per barrel. This is all due to technological advances that were unanticipated.

So let's look ahead. It is not possible to consider every aspect of energy technology here, but I want to focus on a few that are likely to be most important, and in some cases, most controversial. Starting with supply.

There is every reason to believe that there will be continuing progress in oil and gas production. While the theme of the coming decades is likely to be more about recovery than discovery, and about utilisation of non-conventional oil, there is a lot of technological stretch left in this old game. The integration of surface and sub-surface technologies around aggressive use of information technology has the potential for a step change in recovery.

Gas to liquids technology has made impressive gains in the past decade, and there is more to come. For those bringing gas to market GTL competes with pipelines and LNG, though its product(s) serve different needs. We may be at a tipping point for GTL, after many years of effort, where the first world-scale plants using new technology come on stream in the next few years. If high oil prices are sustained, and the corresponding cost of isolated gas does not rise as fast as gas that has easy markets, economics will begin to favour GTL, and producers will see this opportunity as comparable in risk to LNG or pipelines.

Another interesting technological

alternative for gas is 'gas by wire', in which electricity is generated at the wellhead, transmitted to population centres as high voltage DC, and the carbon emissions from the power generation are sequestered at the source. We can expect to see this used in cases where building a pipeline is expensive, environmentally sensitive, or dangerous. Of course, putting a price on carbon would make a big difference to the viability of gas by wire.

Nuclear is also interesting technologically. Today in most circumstances nuclear is too expensive, and the concerns about long lived radioactive waste too serious. Still, new plants are being built, perhaps as many as thirty will commission in the next five years. More importantly, research on a variety of nuclear technologies is proceeding, and fast reactors, hybrid fission/fusion technologies, and other ways of dealing with the waste problem using novel materials all mean that our view of nuclear power may be very different in the next decade.

Now let us turn to renewables. I have already commented on this elsewhere and will just recapitulate the arguments here. Briefly, not all of these are the same in terms of their prospects. If we look at the various renewable energy sources from the viewpoint of possible technological advance, they look very different. For example, wave and tidal power are fairly low tech. Certainly there have been some advances in engineering design to lower cost and improve efficiency, but these have not yielded a competitive technology. And there is no gain that can be foreseen from mass manufacturing. Wind turbines may have some technical stretch left from applying new materials and information technology to control the turbines, all to help at high wind speeds, but again we are talking about less than 25% incremental improvement from where we are today.

Contrast this with the situation for solar photovoltaics and for biomass. Solar PV is an application of materials science, where there is a lot of action today. Novel electronic materials are being developed, and we can expect order of magnitude improvements in the ratio of efficiency/cost for photovoltaics. Will we get to PV devices that can be painted on to roofs, and cost little more than paint? Don't know, but it is a reasonable research goal.

Biomass utilisation for energy is even more prospective. Low cost feedstocks, especially cellulosic feedstocks, are waste products today that could become fuels, speciality chemicals, and primary energy tomorrow. We should expect that biotechnology will deliver improvements in cost of several orders of magnitude. Moreover, new processes will be able to be scaled up quickly, because the process engineering is not difficult.

So there are prospects for renewables, not everywhere but in some important areas.

Now let's look briefly at some of the possibilities on the demand side. Road transport is the easiest place to start, because technology already exists to double the fuel economy of the fleet, without infrastructure change. Hybrid vehicles are already on the market, and while they are only a small fraction of today's fleet, this will change in the coming decade. But most important is that today's hybrid vehicle is only the beginning of what is possible, and we can expect to see ever more dramatic improvement in fuel economy from this technology. It is applicable across the full range of vehicles, requires no infrastructure change, carries only a small cost penalty, and is attractive to consumers at high oil prices.

Fuel cells and hydrogen for transport and stationary power should be the subject of a whole paper in themselves. This technology may make sense, and may achieve all that it needs to achieve in order to be widely accepted, but the jury is still out. What we can say is that the massive research and technology development expenditure in this area will lead to a diverse set of impacts, most of which we cannot yet anticipate. Today's hybrid vehicles use a lot of technology that was developed for failed projects in pure electric vehicles, and we can expect the same thing from the fuel cell effort.

What about domestic efficiency? Sooner or later consumers will wake up to the increasing portion of their electricity bill that is just for appliances on standby (maybe 15% on average already in the UK), and demand changes to how these appliances are made. A technological response is certainly possible to meet this requirement.

That will effectively slow or even stop the growth in electricity demand in the older EU, depending on how fast the number of households grows. The big unknown is the demand for air conditioning. We cannot meet climate change targets for reduction in emissions and air condition all of Europe, unless a radically more efficient form of air conditioning is developed. This will have to be based around combustion and heat pumps.

There are many other technological responses possible for homes, office buildings, and agriculture, and it is not possible to enumerate either the problems or the potential solutions here.

There is one other aspect of importance to a look ahead on energy technology. We have come to think of the USA and the EU as the sources of new technology for the world. The coming decade will show that this is not the case. A lot of the new technology we will be using to meet our energy supply and demand beyond 2010 will come from China, from India, other Asian countries, Russia, perhaps from Brazil or places we have not thought of yet. But certainly China will be a major exporter of new technology, as well as a major user. A more diverse group of creative people working on these big problems must mean that we will have a greater diversity of solutions.

This is a time for great optimism about energy technology. We should expect a lot, and assume that our expectations will again be exceeded.

OPEC in the 21st Century. What has changed and what have we learned?

Pedro Antonio Merino Garcia

Introduction

OPEC was founded in 1960. Looking back, it is hard to detect a constant pattern guiding its actions and policies over these forty years.

Probably its only constant strategy has been to adapt to changing conditions in the relationship between economic growth, oil product demand, oil prices and the supply response. Its reaction has always been slow, but this is largely because it has always been difficult to predict changes or even be sure that these have in fact occurred.

The first question we need to ask when trying to analyse OPEC policies is, 'What is OPEC's mission?' If we look carefully at OPEC's resolutions, the objective mentioned most often is that of 'attaining price stability'. Yet, although this is one of the goals for which the organisation was founded, success seems to become more and more elusive, and, today, price is as volatile as it ever has been.

Perhaps a more accurate definition of OPEC's mission would be that of maximising the profit, or wellbeing, that can be obtained from the international commerce of one product, of which these countries have an abundant supply, by restricting output in a manner that does not induce a dramatic change in demand or technology. The problem for OPEC, however, is that the achievement of this objective depends largely on exogenous factors related to changing conditions in the relationship between economic growth, oil product demand, oil prices and the supply response.

Given the importance of these changing circumstances in judging the efficacy of OPEC, we will first analyse how the variation in supply and demand factors over recent years has strengthened OPEC's position, and then see how OPEC seems to have responded to what now appears to be a new supply and demand environment, very different from that existing over the previous twenty years.

We will also examine some of the measures taken by OPEC since its origins to the present day, and see how, in the current scenario of strong demand, OPEC should keep in mind the lessons it should have learned from the oil crises of the seventies.

Changes in the Factors Influencing Oil Demand since 2000

All the factors on the demand side indicate, in comparison to the 90s, a structural recovery of the demand growth aggregates for oil, provided that there are no shocks to the world economy.

This statement is based, firstly, on the growing importance in the world economy of the emerging countries, mainly those of Asia, and the entry of China on the global international scene. China has evolved from being a net oil exporter in 1992 to becoming, at 3 mb/d in 2004, the third largest net importer, and its weight in the world economy has become impressive. Currently, 23% of the world growth forecast by the International Monetary Fund for 2004 and 2005 (5% and 4.3% respectively) originates in China, 20% in the rest of Asia, and 10% in Latin America. In fact, it is predicted that the world economic growth trend will accelerate in this decade, thanks to the contribution of the emerging countries, well beyond the 3.7% of average economic growth registered over the past twenty years.

Secondly, these emerging Asian countries, mainly China, are showing an elasticity of demand in relation to income or GDP that is much higher than forecast largely due to the huge increases in the transport sector. If China follows the Korean example, the increase in oil consumption will be dramatic (Figure 1).

The third factor is the lower price elasticity of transport activities in industrial countries, where these now represent over 65% of total final oil consumption. As a result, consumption in industrial countries has not been curtailed, as it was in the 70s and 80s, by an escalating oil price scenario (Figure 2).

And finally, the effect of high oil prices on world GDP is not jeopardising economic growth, as it tended to in the past As a result, we seem to have reached a situation in which, if world GDP is not curtailed by higher oil prices, economic growth will feed an ever-increasing demand for oil.

It can be seen, therefore, that in recent years, and especially in 2004, consumption has followed a different pattern from that observed in the nineties or in other times of nominal oil price highs. At present, all the signs point to a continuing increase in

Figure 1: Per Capita Oil Consumption and GDP Per Capita (1971–2000)

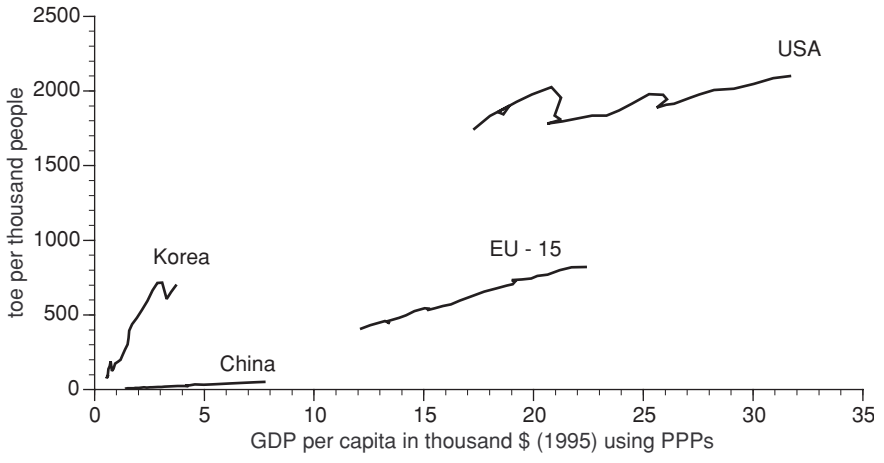
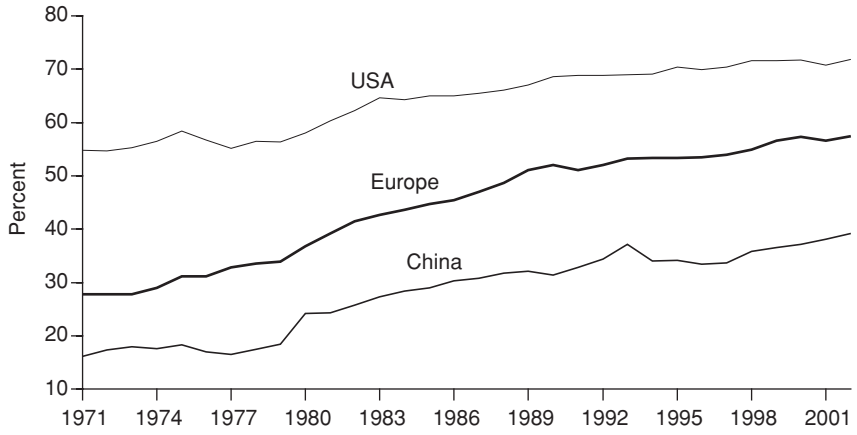


Figure 2: Oil Consumption in Transport Sector as Percentage of Total Oil Consumption



demand in the coming years, based on strong economic growth.

Changes in the Factors Determining Oil Supply: investment cycle and management of the OPEC surplus

Until 2003, the most common prediction was that non-OPEC supply would continue to rise and OPEC would continue to manage its surplus capacity successfully. In other words, there would be a scenario of balanced interaction, but with higher prices. This view of the oil market situation has been challenged recently by numerous market analysts and operators. They give as their reason that this balance has been broken and that renewed demand strength requires a more dynamic supply response, which does not as yet seem forthcoming. High consumption has brought with it an inability to increase output sufficiently in the short term.

There are several reasons for this.

Firstly, from 2003 onwards, and especially in 2004, it has become apparent that many of the mature oilfields are beginning to show greater signs of exhaustion than they were only a few years ago. This is not just the result of the finite nature of these reserves, but also because of the higher rate of exploitation to which they have been subjected due to the type of investment made and the extraction technology used. These new technologies make it possible to lift more oil more quickly, but have speeded up the rate at which oil fields decline.

Secondly, lower investment in exploration has translated into fewer discoveries over the past fifteen years. Indeed many of the long-term oil production forecasts predict that maximum production in the non-OPEC area will be reached in the next ten to fifteen years and will then begin to decline.

Furthermore, according to most published sources OPEC spare capacity has been slowly shrinking since 2002, reaching a low of only 310,000 barrels per day in September 2004, which represents less than 0.5% of the world's daily production (Figure 3).

This number is indicative of the tension on the supply side, given the geopolitical risks affecting production in some OPEC countries. Doubt is being expressed as to whether the 'spare capacity' is sufficient to satisfy demand requirements in the face of even minor operational problems.

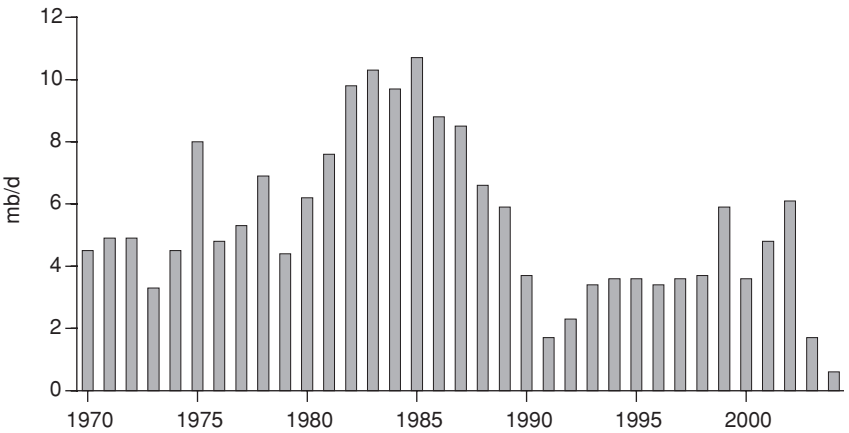
We must therefore conclude that it is the perception of a short-term lack of supply response to soaring demand that has, in part, pushed prices upwards. It is fundamental to traditional supply dynamics that sharper demand requires a term of high investment, and that there will be a measurable delay before this is followed by higher production

Changes in the Environment and OPEC Actions and Policies

For the purposes of this analysis it is relevant to underline the two very different effects that OPEC policy has had through the years since it took over the role of oil price management. From 1973–87 its high fixed price policy had the effect of creating the non-OPEC oil development which, combined with demand reduction, led to the collapse of prices and the creation of a huge OPEC spare capacity.

From 1987–2003 a moderate approach to price via a reference price basket has assisted in creating an economic development environment which has essentially mopped up all the spare capacity, both in OPEC and non-OPEC. The gradual increase in the target price from $18 to $21 and then to $22–$28 has also been reflected in changes in production policy by Saudi Arabia.

Figure 3: OPEC Spare Capacity. Million Barrels per day



1973 to 1987

This period was marked for the most part by the high level of profit in dollars earned by OPEC on its oil exports. The role of OPEC was more or less limited to covering the marginal demand left unsatisfied by other producers, particularly in the years following the 1979–80 crisis, and this resulted in reduced total production. This in turn led to the high levels of OPEC spare capacity, which reached 10.7 million barrels per day by 1985, and subsequently to the collapse of price which depressed OPEC revenues back to 1972 levels.

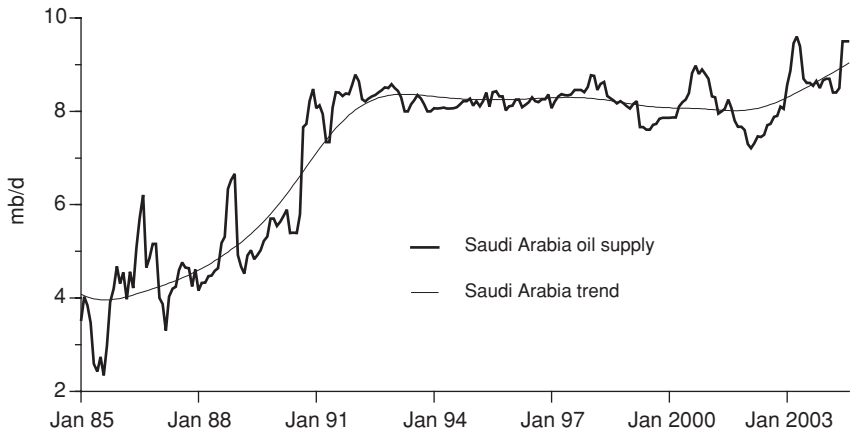
1987 to 2003

The second period, beginning in 1987, was marked by the slow yet continuous reduction of OPEC's spare capacity and the appearance on the scene of two new protagonists, the developing countries of the Far East and the former Soviet Union countries, which contributed to bring a new set of dynamics to the global oil market (Figure 4).

As far as OPEC was concerned, two aspects should be noted. The first is that prices were successfully maintained more or less within the reference or target price, averaging around $15 between 1987–90, $17 from 1990–99, $26 in the period 2002–3, increasing to $28 in 2004.

Secondly, it should be noted how each change in the target price set by OPEC is marked by a significant change in the pattern of production from Saudi Arabia.

Figure 5: Saudi Arabian Oil Supply



As can be seen from Figure 5, in the years when target prices were changed there were important variations in Arabian production. Furthermore, since 2003, there has been a new change in trend regarding production from Saudi Arabia, but this time without as yet any change in the reference price.

Looking Ahead

The question for the period from 2004 is whether we are in a new phase or whether the upheavals of 2004 are in fact only a temporary blip within a basically stable situation. And how will OPEC react?

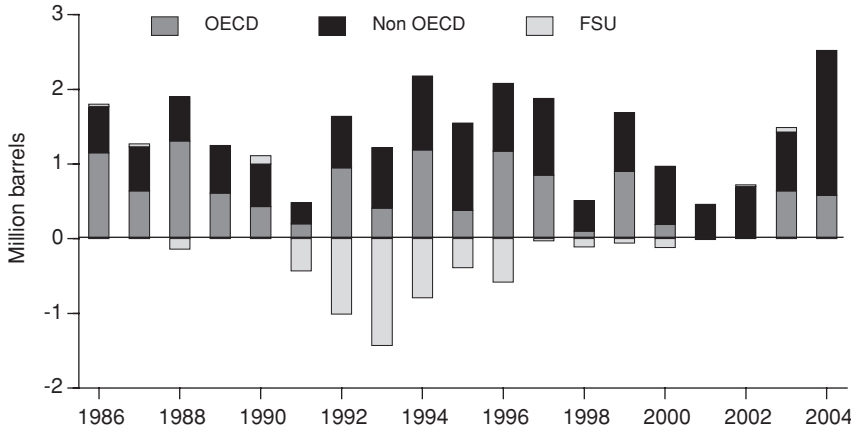
As already noted, both supply and demand conditions seem to have undergone a profound change in the past two years. The dynamics introduced in the global oil scenario by a larger presence of emerging countries on the demand side, particularly in the Far East, has gathered momentum. Simultaneously, supply problems emerged because of declining production rates in non-OPEC countries; lower production growth in Russia; the reduction of OPEC spare capacity, and a constant fall in stocks of commercial crude oil and oil products in the OECD countries.

This situation suggests that we may be on the threshold of a new phase for OPEC, in a context of exceptionally strong demand, limited spare capacity, and a lower share of the OECD countries in world economic activity.

On the supply side, this is already producing a new composition in world oil in which OPEC has recovered market share without needing to curb prices, in which Russia's share in world production seems to have stabilised after several years of growth, and in which production from the rest of the world has been declining since 2002.

However, if we look at the wording used by OPEC in explaining its policy decisions it does not yet denote any recognition by OPEC of this possible new phase. This can be seen in the communiqués following OPEC meetings which generally attribute the

Figure 4: Petroleum Demand Growth 1986–2004



high level of oil prices to factors other than supply/demand pressures as can be seen from Table 1.

As can be seen, the factors most repeated by OPEC since 1999 to explain its decisions are stock levels, market speculation, geopolitical factors and its target price band. The supply and demand balance, only fifth in importance, does not seem to be a matter of particular concern. Nor has there been any reference to the performance of quota agreements, which may imply that the cohesion within OPEC as a group is not perceived, in contrast to the 90s, as a problem.

Table 1: Factors used by OPEC to explain its Decisions

Key factors mentioned in OPEC's Official Press Releases since 1999	*First Mention*	*Number of mentions*
Level of oil and product stocks	22/09/1999	10
Market speculation	01/07/2000	9
Basket price range	05/06/2001	7
Geopolitical factors	26/06/2002	7
Supply/demand situation	01/10/2000	5
US$ exchange rate	14/11/2001	2

Moreover, if the organisation wishes to avoid the kind of price escalation that could cause a substantial fall in consumption growth, we might have expected some reference to the problem of limited production capacity.

If, indeed, we have entered a new phase, there are three interrelated questions to be answered: 'Is it possible to increase OPEC spare capacity, and if so, for how long?' 'Will Saudi Arabia still be able to act as a swing producer in the coming years?' And finally, 'Will OPEC set a new reference price that will allow oil demand and economic activity to continue expanding?'

OPEC's policy is likely, as in the past, to be adaptive and probably slow to change. This may, indeed, be the logical response and would at least be consistent with other energy players and commentators such as the International Energy Agency (IEA), which was forced, between July 2003 and October 2004, to make an upward revision of over 3 million barrels in its growth forecasts for oil demand in 2004.

Be that as it may, consuming and producing countries alike should have learned their lesson from the crises that occurred in the seventies and bear in mind, when making their decisions, that the supply and demand conditions now appear to be fundamentally different from those that existed in former periods of oil price escalation.

In its own response to this situation OPEC will demonstrate whether it is able to maintain its existing capacity to influence oil prices, and, by extension, to sustain or increase the revenues earned on its crude oil exports.

This article expresses the independent opinion of the writer and does not necessarily coincide with that of his company.

The Private Oil Companies: From Consolidation to Growth

Robert Arnott

At the time when the *Oxford Energy Forum* was first published the business environment in which the private oil companies operated was very different to today. Political barriers effectively ruled out investment in most OPEC countries as well as in countries under communist rule. And until the 1990s, technological barriers prevented companies from exploiting reserves in deepwater reservoirs. Smaller niche players may have been able to enter politically sensitive areas, but they lacked the financial resources to take on either the large-scale development projects in those countries or the risks involved with frontier technology.

At the beginning of the 1990s, the changing political playing field combined with tremendous improvements in technology has opened up a whole host of new investment opportunities, and the major integrated companies were best positioned to exploit them. They had the financial resources and the associated risk-bearing capacity to take on such projects without compromising the financial health of the entire company.

Against this backdrop of new opportunities, the optimism of a recovery in oil prices began to fade. Companies entered the recession of the early 1990s with overly-optimistic capital expenditure programmes, and the result was a collapse of profitability that hit the entire industry, not merely BP, whose financial implosion was the most severe. Private oil companies began to plan on the basis of flat real and in some cases flat nominal oil prices. This had serious financial implications. In the past they had been able to hope that rising oil prices would help them overcome cost pressures and balance sheets inflated with costly investments and acquisitions made during the 1980s. With the new realism it was recognised that in order to improve profitability, costs had to be driven down. In a prophetic speech made in 1989 by Lord Browne of BP, it was stated that companies could not control prices or volumes but that they could control costs. The companies all responded in much the same fashion: operating costs and capital costs were slashed, investment opportunities were screened using oil prices of $15–18 a barrel and returns on capital employed (ROCE) in the mid-teens were targeted.

There was no particular justification for the returns targets. Any traditional calculation of the weighted cost of capital for the oil industry throughout

the 1990s would have resulted in a lower target. It seems that the determination to exert financial discipline resulted in the setting of targets that was driven more by benchmarking and a desire to improve on historical performance than by any rational computation of either the cost of capital or the actual internal rate of return (IRR) that the companies were generating, or could hope to generate.

The focus on cost reductions to improve financial performance was also well rewarded by the financial community who became fixated on near-term return targets based on 'mid-cycle' price assumptions and who rewarded the companies who responded the most vigorously. Cost reductions did lead to significant improvements in profitability, but the reductions had a brutal impact on the workforce, which left the industry without a generation of engineers and petroleum geologists. The number of employees in the top twenty private oil companies by market capitalisation was cut from 973,000 in 1990 to 680,000 by the end of 2000. How ironic it is that now that the private oil companies are striving for growth, a major constraint that they claim is holding them back is said to be a lack of manpower.

By the late 1990s, the cost cutting was coming to an end and the need for some uplift to capital expenditures was beginning to become apparent. The first response to this was a heroic round of mergers, with the aim of achieving further reductions in operating costs, while also creating the opportunity to open up the widest possible reinvestment opportunities: in the words of BP's CEO, on the announcement of the merger with Amoco, 'Together we can do more than either of us could have done separately.'

The scale of the corporate consolidation went far beyond most commentators expectations and even seemed to scale political obstacles. At the end of the 1990s the 21 largest private oil companies had consolidated into just eleven companies. In 1990 Exxon and Royal Dutch/Shell were the two largest companies by market capitalisation. However, by 2000 they had been joined by BP, whose acquisitions of Amoco and ARCO had transformed it into a major multi-regional 'super-major'. In France, where a union between Elf and TOTAL had seemed politically impossible, the merger created a single national champion which also incorporated the Belgium company Petrofina.

"The statistics highlight the constrained world in which the private oil companies continue to operate"

The round of corporate consolidation led to a further round of cost-cutting but as these opportunities were exhausted so came a newer and perhaps more challenging task which involved the need to replenish portfolios of old assets with newer ones. After fifteen years during which the companies always seemed to be able to add to their reserves and production at a greater rate and lower cost than had been expected, by the millennium this combination had reversed. Rising finding and development costs upstream and falling reserve replacement ratios reflected the maturing of the traditional producing basins of the non-OPEC oil world.

The statistics highlight the constrained world in which the private oil companies continue to operate. At the end of 1991, the oil and gas reserves of the top 20 private oil companies totalled 50 billion and 33 billion boe respectively. By the end of 2003, just eleven companies survived from mergers and acquisitions amongst the same group having oil and gas reserves totalling 57 and 40 billion boe respectively. In other words, throughout the whole of the 1990s reserves growth for oil was just 1.3 per cent per annum and 1.9 per cent for gas.

The story with respect to production growth is even less impressive. At the end of 1991, oil and gas production of the top twenty private oil companies totalled 11.8 and 6.2 million boe/d respectively. By the end of 2003, oil and gas production was 12.6 and 7.7 million boe/d respectively giving an annual growth rate for oil production of just 0.6 per cent and 2.0 per cent for gas production. Even with the cost-cutting measures the annual growth in net income has been just 1.9 per cent since the first *Oxford Energy Forum* was published.

So, in the uncertain post-2004 environment, the good news is higher oil prices. The bad news is higher costs and fewer investment opportunities. Investors appear to have recognised the loss of growth opportunities, but appear to have failed to respond to the substantial uplift to the value of the existing assets of the companies, possibly because their value is not transparent in the way in which the companies' accounts are presented and possibly because they are less than convinced that the private oil companies can generate sustainable organic growth. The negative response of investors to a recent strategy presentation by Royal Dutch/Shell, in which the company stated that it would increase capex and raise the oil price it uses to screen projects, demonstrates the degree to which shareholders have influenced corporate decision making with respect to increases in expenditure.

From the companies' point of view, although regeneration of the asset base and organic growth are now priorities, a lack of confidence in oil prices being sustained above $30 per barrel combined with the corporate memory of operating in a low oil price and cost-cutting environment has also acted as a brake on spending. This is ironic because the cash flows of the major companies have never been stronger. The uplift in corporate spending on new developments is now beginning to come through, with spending for the top thirty companies having risen from around $68 to $90 billion from 2000 to 2004. However, in the context of the increase in cash flow, the incremental development spend is relatively small and in 2004 the amount of money returned to shareholders in the form of share buy backs and dividend payments could

actually exceed investment in the upstream business.

So where does that leave the private oil companies going forward from 2005? At the moment, the buzz word in the industry is 'access'. In a world of volatile crude oil prices and where the resource base is almost entirely held by the national oil companies or national governments, western oil-importing countries are calling for greater access to these reserves in order to help stabilise oil prices and achieve a greater sense of security of supply. For the private oil companies, access to reserves is a necessity if they are to meet longer-term organic upstream growth. In a world of global demand increases for oil and gas of 1.6 and 2.2 per cent per annum respectively since 1993, the private oil companies have failed to maintain their market share. Without access to the resources held by the national oil companies a further round of consolidation will be inevitable. However, with fewer and larger players dominating the markets it seems that the next time round regulatory hurdles might be set a lot higher.

What Role Derivatives?

Paul Newman

Over the last thirty years, the leading economies have enjoyed tremendous efficiency gains from increased factor productivity within the energy sector. The amount of oil involved in producing one dollar's worth of GDP has fallen by nearly 50% in Europe and the USA, and by even more in Japan. But the importance of these gains has been completely overshadowed by massive overall growth in aggregate demand for oil: at around 82 mb/d, global consumption today is eight times larger than it was in the early 1950s. Either way, oil still represents something approaching 40% of the world's supply of energy.

If consumption patterns have had clearly defined direction, the price action obviously has not. Since as far back as 1930 (when the price of a barrel of oil fell from $1 to 6 cents in a single year), the precariously balanced nature of the supply/demand equation has meant that planners could assume no certainty about tomorrow's price. In August 1993, two well presented articles appeared in *The Economist*, signalling a likelihood of a sharp upturn in oil prices over the coming years. Two months later, a leading world expert told a Tokyo forum that the outlook could be more like $13–$14 per barrel. When it comes to price uncertainty, nothing changes. In autumn 2004, we saw oil prices increase by half in a few months. The truth of the matter, of course, is that we just never know.

Against this background, the growth of a coherent derivatives marketplace had probably become inevitable. Oil is both important, and price-uncertain. But these alone are not sufficient conditions for the growth and credibility of a substantial derivatives market; there are at least two further necessary conditions. In the first place, we must have sensible price indices which we can use as settlement reference points; indices which are widely credible, and which are openly published. Secondly, the underlying physical markets must enjoy good liquidity, thrown up by the opposing interests of a widely based variety of both consumers and producers. Thirty years ago, over three-quarters of the world's traded oil was transacted by a handful of oil majors, through long-term fixed price contracts. Today, that same group accounts for only about a quarter of the world's traded oil. At the same time, nearly three-quarters of international trade has become linked to the spot price. In the mid 1980s, when OPEC started to shift away from price targets towards output targets, the stage was becoming clearly set for comparatively freely-floating world oil prices, and the uncertainty which necessarily accompanies them. Indeed, we can look to the shock of Q1 1986 (when oil prices fell some 75% in four months), as the key milestone. This was the moment when the appropriate conditions for a derivative market were now matched by demand for a proper forum for forward price discovery, and for price risk management tools.

"the growth of a coherent derivatives marketplace had probably become inevitable"

These trends have been reflected in the growth in turnover and credibility which the world's two leading futures exchanges have been enjoying – the Nymex benchmark crude contract has seen its volumes multiply over the last years, while turnover on the London IPE crude and gasoil contracts have increased by a factor of 5 since 1990. As much as half of the open interest on the futures exchange is now thought to be accounted for by the hedging activities of swaps providers and traders. Less visible than the exchanges – but certainly not less significant – is the enormous interest in the 'Over the Counter' derivatives market for energy price swaps, and their second order instruments such as price caps and floors, and options on price swaps, (known in the trade as 'Swaptions'). Even now, it is hard to believe that there was no such thing as a coherent and transparent two-way marketplace for over-the-counter energy price swaps before 1990, and today it is clear that this segment will continue to dominate developments for the next stage of the industry's growth.

In Europe, the oil swaps industry market concentrates largely on those areas where there are no futures contracts available, or else on those where there is not sufficient liquidity in the longer dated contracts to ensure comfortable execution. More than three-quarters of the over-the-counter swaps turnover has centred on Brent and WTI crude, Rotterdam fuel oil, and Gasoil or Jet, with the balance

coming from gasoline and naphtha. Since 1990, the total exposure for the energy swaps market is estimated to have reached $1.5 trillion of notional underlying value – still a young market by comparison with the successes of the mature derivatives markets for OTC interest rate derivatives, but a sector which is enjoying annual compound growth.

As a guide, volume alone has its limitations. There are probably around fifteen hundred OTC oil derivatives price swaps per day being executed in the market – traded routinely by some sixty organisations. Liquidity is provided by the presence of three or four mainline internationally based broking houses. The size and maturity of each transaction varies enormously, but an average product swap might be 10,000 metric tonnes per month of a three-month run, such as 2nd quarter 2005 3.5% Rotterdam fuel barges. A typical crude swap might be 100,000 bbls per month of 2Q 2005 Brent or WTI. Equally, however, it might easily be 100,000 bbls per month for the calendar year of 2005 or 2006.

"all actors now refer to the long-term swap price as an input component in the planning process"

The arrival of derivatives has undoubtedly reduced the potential for market 'squeezes', and so it can legitimately claim credit for having helped to bring order to the markets. But another of the important contributions which the growth of the price swaps market has made is that for the first time, we can see genuine long-term curve shape. In crudes, for example, for several years there has been a clearly defined inter-year spread market available out to four or five years forward, allowing real, liquid two-way pricing. The pricing has a bid/offer spread of less than 5 cents for the shorter maturities (e.g. three years). This year, however, has seen the emergence of transparent price discovery in the very long-dated parts of the crude maturity curve, with interest readily being expressed out for fifteen years.

The very appearance of a visible curve shape has important consequences for the market's capacity to attract fresh users, and therefore for its future growth. Historically, many of the assumptions which underpinned important capital investment programmes were based on fundamental forecasting alone – pie in the sky in many cases, as things turned out. But the 'early teenage' years of the oil price swaps markets have delivered a confident and reliable place to look for valuation, and all actors now refer to the long-term swap price as an input component in the planning process. In exploration, for example, investors are carefully noting the red flags which the backwardated nature of the longdated crude price curve implies: crude oil three years forward is being priced – and can genuinely be fixed – at a full $3 per bbl lower than the spot price, with the market signalling an expected structural price upturn again only seven years from now.

For oil companies, traders, investors and end-users, the price discovery which the swaps market allows are an exciting development. For too long, oil companies have had to allow the value of their stock price – and therefore their capacity to raise fresh capital – to be immediately correlated to the price of a barrel of oil. Increasingly in today's world, the ability to reduce this uncertainty can free such companies up to focus on three simpler issues which will matter most to their increasingly sophisticated shareholders: the value of the assets, the value of the management input across those assets, and the expected return on capital to investors. Indeed, institutional shareholding investors and hedge funds, seeking to add oil price risk to their portfolios, have themselves now become end-users of the derivative market, recognising it as the place where forward oil prices can most naturally be discovered.

Critics argue that while a curve of some clearly defined shape does now exist for volumes such as 100,000 bbls–200,000 bbls per month, the actual liquidity for larger volumes is limited. They would argue that it is still difficult to execute much more than a quarter of a million bbls per month of 2006 risk without disturbing the market. If this is still so, it is nevertheless quite clear that liquidity is increasing month by month, as fresh end-using participants embrace the opportunities offered by these maturing instruments.

Multilateral Energy Co-operation in Northeast Asia: Promise or Mirage?

Philip Andrews-Speed, Xuanli Liao, Paul Stevens

In Northeast Asia are juxtaposed one of the world's largest energy producers (Russia) and some of the world's major energy importers (China, Japan and South Korea). At the same time the region forms the stage for some of the world's great power games. Russia, China and Japan are each a substantial economic and political power in their own right. The USA has a major political and military presence in the region. Finally, the problems of the Korean peninsula and of Taiwan remain unresolved.

At a time when energy demand in Northeast Asia continues to rise (mainly driven by economic growth in China) energy co-operation between these parties should bring direct economic benefits. These would include a reduced dependence on the Middle East for oil supplies, higher levels of investment in energy projects and greater transmission of energy within the region. With respect to the first of these, Japan has long held the view that over-dependence on the Middle East is inherently risky on account of

the political instability of this region. The last few years have seen China adopt the same perception. Together these three elements of co-operation should enhance the security of energy supply for the region, reduce the unit cost of energy and thus further enhance economic development and regional security.

Northeast Asia's Energy Challenge

The energy challenge for Northeast Asia is twofold. The first is the need to satisfy the energy needs of the major economic powers in the region, Japan, South Korea, China and Taiwan, all of which have a growing demand and a growing net import requirement (see Table 1). They are, moreover, at the same time in competition with other Asian states. The second, and related, challenge is for Russia to attract investment for the exploitation of the primary energy resources in the east of the country in such a way that the country and the eastern region realise a benefit. Given that Russia's energy exports and earnings have risen dramatically in recent years and that the government shows no urgency in exploiting the energy resources in the east, it is the first of these challenges which is driving discussions on energy co-operation in Northeast Asia.

Japan, South Korea, and Taiwan are each net importers of oil, gas and coal, whilst China is a net importer of oil, and a net exporter of coal. Both consumption and the net import requirement for the region rose significantly in the year 2003 for all three fuels (Table 1). These four countries together account for not only a substantial share of the world's total energy consumption but, more importantly, a growing share of global incremental energy demand: 51% for oil, 18% for gas and 70% for coal. The same year also saw the region's incremental imports accounting for approximately 34% of incremental globally-traded oil, and 19% of traded natural gas (Table 1).

The trends of growing energy consumption and growing energy import requirement for the region is set to continue increasing for the foreseeable future, underpinned by China's rapid economic growth and inefficient energy sector (Table 2). These trends necessarily raise concerns of security and cost of energy supply for these countries.

The Potential Role of Multilateral Co-operation

Multilateral co-operation between states has the potential to play a major role in enhancing security of energy supply and the cost of energy supply in the region. The primary aims of such co-operation are to remove obstacles to investment in energy production and to the transportation of energy across international boundaries, and to set up specific mechanisms to deal with energy supply crises.

Multilateral energy co-operation can enhance the overall energy security and reduce the overall unit cost of energy in the region in a number of ways:

Table 1: Summary statistics on consumption and net import requirements for main energy-importing countries of Northeast Asia for the years 2002 and 2003

	Consumption		*Net import requirement*	
	2003	*% Change 2002–2003*	2003	% Change *2002–2003*
Oil tb/d				
Japan	5451	1.7	5451	1.7
South Korea	2303	0.9	2303	0.9
China	5982	11.2	2586	29.8
Taiwan	880	4.4	880	4.4
Region	14616	5.4	11220	7.1
Region/World	18%	51	24%	34
Gas bcm				
Japan	76.5	6.4	76.5	6.4
South Korea	26.9	4.7	26.9	4.7
China	32.8	10.8	0	0.0
Taiwan	8.7	2.4	8.7	2.4
Region	144.9	6.8	112.1	5.7
Region/World	5.6%	18	18%	19
Coal mtoe				
Japan	112	4.7	110.7	4.8
South Korea	51.1	4.1	47.8	4.4
China	800	15.3	-70	9.1
Taiwan	35	7.0	35	7.0
Region	998.1	13.1	123.5	3.4
Region/World	39%	70	20%	–

Principal source: *BP Statistical Review of World Energy*, 2003 and 2004.

Table 2: Key changes in projected energy demand and energy imports for the year 2020 in comparison with 1999. 1999 = 1.0

	Japan	*S.Korea*	*China*	*Taiwan*	*Region*
Final energy demand: 2020/1999	1.20	2.00	1.75	1.76	1.63
Oil demand: 2020/1999	1.08	1.63	2.43	1.34	1.64
Net oil import: 2020/1999	1.09	1.63	7.78	1.34	1.89
Oil import/demand: 1999	1.00	1.00	0.22	1.10	0.74
Oil import/demand: 2020	1.00	1.00	0.69	1.00	0.85
Gas demand: 2020/1999	1.38	2.87	5.29	4.38	2.67
Net gas import: 2020/1999	1.44	2.87	n/a	4.50	2.76
Coal demand: 2020/1999	1.18	2.56	1.59	1.92	1.60
Net coal import: 2020/1999	1.20	2.91	(5.25)	1.93	1.39

Source: APEC Energy Demand and Supply Outlook (Tokyo: APERC, 2002)

Table 3: Summary of the main types of potential energy co-operation, and selected benefits and constraints

Type of co-operation	*Specific benefits*	*Specific constraints*
Transboundary networks (Oil, gas, electricity)	• New energy • Additional energy • Increased reliability • Lower cost • Clean energy (gas) • Revenue (RF)	• Distrust (esp. DPRK) • High cost • Better alternatives (e.g. LNG) • Economic nationalism • Poor FDI climate (RF) • Indecision (RF)
Joint Exploration & Production in disputed waters	• Additional energy • Lower cost • Better management	• Distrust • Economic nationalism
Security and Political initiatives such as SLOCS and Middle East issues	• Increased reliability • Reduced risk of interruption	• National security
Market information, especially oil	• Improved functioning of markets • Emergency response capability • Increased reliability	• National security • Economic nationalism
Nuclear power	• Improved management • Environment • Safety • Revenue (J)	• Better alternatives (France, USA) • National security
Emergency response mechanisms, especially oil (storage, sharing)	• Emergency response capability • Revenue (J, RoK)	• Distrust (free rider) • Economic nationalism • High cost • Insufficient benefit
Environmental measures especially coal use	• Cleaner environment	• Cost

RF = Russian Federation; DPRK = Democratic Republic of Korea; RoK = Republic of Korea; J = Japan; SLOCS = sea-lanes of communication.

- Enhancing long-term security of energy supply through the investment in development of primary energy resources, and through investment in construction of transportation infrastructure for energy products (crude oil, oil products, gas, electricity).
- Improving capability to react to oil supply crises, through the construction of emergency stocks and the development of sharing mechanisms and market information systems.
- Producing mechanisms to develop resources jointly in disputed waters and for deposits which straddle defined borders.
- Reducing the environmental impact of energy production and consumption through promoting the use of clean energies and the development and trade of energy efficiency and environmental technologies, by addressing regional environmental issues relating to energy (nuclear, acid rain, marine and river pollution), and developing global warming abatement mechanisms.
- Promoting coordinated approaches to international political and security threats to energy supply.

The peculiar economic and political characteristics of energy mean that all forms of energy co-operation will involve governments facing a conflict of interests, between those of their country and those of the multilateral group. Despite good intentions and favourable rhetoric, most governments will tend to put their own interests ahead of those of the multinational collective. Indeed, on some matters just reaching an agreement can be a major challenge, let alone implementing it. Table 3 summarises the principal benefits and constraints to the main forms of co-operation.

Effective energy co-operation between two or more states requires long-term commitments between governments, preferably underpinned by legally-binding agreements and by permanent institutions. The most prominent international regimes specifically designed for energy co-operation, but with quite contrasting objectives, are the Organisation of Petroleum Exporting Countries (OPEC) and the International Energy Agency (IEA). A further energy-focused institution, but one which has yet to make its mark, is the Energy Charter Treaty (ECT).

Of possibly greater relevance to Northeast Asia are those organisations which have a wider economic scope, but within which energy plays an important role. These include the European Union (EU), the North American Free Trade Agreement (NAFTA) and Mercosur.

Current Energy Co-operation in Northeast Asia

Until recently, all meaningful intergovernmental discussion on energy co-operation in Northeast Asia has been on a bilateral basis and few agreements of real substance have been reached, with the exception of specific investments by companies in purely domestic, rather than transboundary projects. Such bilateral energy co-operation in Northeast Asia was limited mainly to the trade of modest quantities of oil and coal, and to Japanese investment in China's upstream oil industry. In recent years a number of more ambitious projects have been discussed. These include Gazprom's potential but unrealised involvement in China's west-to-east gas pipeline, the construction of oil and gas export lines from Russia to China and South Korea, and the sale of LNG from Russia to China and Japan.

No stable and authoritative institution exists for the deliberation and

development of multilateral energy co-operation in Northeast Asia. Two types of multilateral institution involved in energy in the region can be identified: those institutions which have a wide geographical scope and which happen to include Northeast Asia such as APEC, IEA, Energy Charter Treaty, and ASEAN + 3; and those institutions which are focused on all or part of NE Asia, for example the Tumen River Area Development Programme (TRADP) and the Korean Peninsula Energy Development Organisation (KEDO). Besides these, there are a number of organisations which bring together government officials and academics for regular conferences. Examples include the Northeast Asia Oil Forum, the Symposium on Pacific Energy Co-operation, the Northeast Asia Gas and Pipeline Forum, the Northeast Asia Economic Forum and the Nautilus Institute.

Of these, the most active institution which has the greatest relevance to the energy importing countries of Northeast Asia is ASEAN + 3, a grouping which includes the ten ASEAN states plus Japan, China and South Korea. In the last two years ASEAN + 3 has identified five priorities for study and potential co-operation:

- The creation of an emergency network;
- The development of oil stockpiles;
- Studies of the Asian oil market;
- Improvement of natural gas development and transportation;
- Improvement of energy conservation and renewable energy.

ASEAN + 3 possesses two major drawbacks as a potential framework for energy co-operation in Northeast Asia. Firstly, the group does not include Russia, a major potential energy supplier. Secondly, the economic characteristics and energy needs of the Northeast Asian states are quite different from those of the ASEAN members. Japan and South Korea dominate the grouping in terms of GDP and energy import dependence, and together with China they dominate with respect to population and energy consumption. The geographic location of these three nations makes Russia attractive as a potential source of energy import, whereas the ASEAN states are better positioned to look west to the Middle East.

APEC has concluded two major studies on cross-border trade in both electricity and gas. Though Russia is a member, it is difficult to see APEC playing a crucial role in the development of multilateral energy co-operation in Northeast Asia because the regional scope of APEC is so large and its framework lacks legally-binding obligations. The Asian Co-operation Dialogue (ACD) is a similarly diverse group of nations within a non-binding framework, which stretches from Bahrain in the west, to Indonesia in the east and Mongolia in the north, but does not include Russia. In June 2004 the ACD launched the 'Qingdao Initiative' to voluntarily enhance energy co-operation between member states.

"The peculiar economic and political characteristics of energy mean that all forms of energy co-operation will involve governments facing a conflict of interests"

The Energy Charter Secretariat and the International Energy Agency are both active in Northeast Asian energy discussions and both offer model frameworks for addressing different energy challenges. However as neither Russia nor China are yet full participants of these institutions, it is difficult to see the role of the ECS and the IEA being anything more than advisory and exhortatory.

KEDO was established in 1995 in order to address the nuclear and energy supply issues in North Korea. Its membership includes South Korea, Japan, the United States and a number of other countries from outside the region. Although North Korea occupies a strategic location in the context of Northeast Asia energy co-operation, the ability of KEDO to contribute to such co-operation is presently constrained by its limited membership, its narrow focus and recent events which have rendered it inactive.

TRADP's membership is well-suited to addressing the energy challenges of Northeast Asia. China, North and South Korea, Russia and Mongolia are signatory members whilst Japan is an observer. TRADP was established by the UNDP in 1991 with the objective of creating a hub for international transport, trade and industry, but progress has been constrained by political, economic and physical obstacles. The importance of energy transportation to the region has been recognised, but TRADP recognises that the scale of the challenge is beyond the scope of its programme except to promote discussion on possible frameworks for energy co-operation and to undertake studies.

Another UN body, ESCAP (Economic and Social Commission for Asia and the Pacific) is in the process of establishing an intergovernmental collaborative framework for energy co-operation in northeast Asia. A series of meetings have been held since 2001 which have promoted the establishment of a Senior Officials Committee and a number of working groups to address specific areas of potential activity. These meetings have been attended by officials from the relevant governments (but not all governments have been represented at each meeting) as well as from other international institutions such as the IEA, the Asian Development Bank and the Asia Pacific Energy Research Centre.

A final, but apparently unlikely, potential candidate for the role of driving Northeast Asia's energy co-operation is the Six-Party Talks of which China, North and South Korea, Russia, Japan and the USA are members. This informal institution is currently focused on addressing the immediate political and security challenges on the Korean Peninsula. But given the vital role of energy supply in stabilising the peninsula, it is conceivable that this grouping could develop into a more formal economic

institution once solutions to the challenges emerge. The European Union provides a precedent, as its origin also lay in political and security concerns.

Outlook

Despite the importance and urgency of the need, and the proliferation of pertinent meetings and groupings, the outlook for the development of substantive multilateral energy co-operation in Northeast Asia is not good in the near term. Indeed, even bilateral initiatives are being obstructed by inter-government distrust, for example Japan and China, and domestic indecision, for example Russia. It is this distrust and the complementary conflicting interests which constrain both the progress of specific projects and the development of substantive institutions for multilateral energy co-operation. Individual and collective leadership is required from the key heads of state in order to set aside political differences and establish a legally-binding framework for multilateral energy co-operation in the region. Only then can the energy supplies be secured at a reasonable cost.

Lessons for North America

Edward Morse

Energy issues should have provided clear political lessons to governments over the past fifteen years, especially the United States, which twice led coalitions to battle in the Middle East over matters in which oil played a significant role. It was also a period when revenues from oil and the symbolic ties between the world's largest oil producer, Saudi Arabia, and Washington, became central to the al-Qaeda attacks on New York and Washington. Even in the domestic arena energy should have been front and centre, providing lessons for the future. For in the USA there were periodic spikes in gasoline, heating oil, natural gas and electricity prices, major power disruptions on both coasts and frequent public debates over LNG imports, environmental regulations, and resource exploitation on government lands, among other issues.

Yet, perhaps the most remarkable lesson of the past fifteen years for most people living not only in the USA but throughout the OECD is that energy issues are either not salient enough or tractable enough to rise to the top of the political agenda for long. This is certainly the case for the USA, Canada and Mexico (the three governments in the North American Free Trade Agreement), which, except for brief moments have found the status quo to be politically comfortable. Despite the episodic moments during which an energy issue has come to the fore, with rare exceptions that moment passes before critical decisions are required, and the government is free to ignore and avoid the difficult tradeoffs that are required.

Despite this complacency and the difficulty of moving away from the status quo, major challenges have emerged, both regionally and globally, and it is worth reviewing some of these challenges in that they may provide lessons for the future.

In the USA and Canada, as in most of the OECD (but certainly not in Mexico), two major trends have unfolded over the past decade and a half. These have involved first, the withdrawal of the state from active management of the energy sector, and second, the granting of authority to deal with the major factors affecting energy policy to technocrats charged with implementing environmental laws and regulations.

The state has, at both the federal and the state, or provincial levels in both countries relied increasingly on market forces rather than regulation to provide the framework in which energy commerce and investment unfold. For most of this period, the withdrawal of the state has not only borne few costs; it has spun off perceived tangible benefits. That's because, until quite recently, energy prices to consumers fell substantially over the time frame and governments and publics drew the conclusion that deregulation of energy markets bore permanent benefits. Indeed, through most of the 1990s, declining energy costs were a major factor in the extraordinary economic growth that took place in North America.

Yet, two situations have emerged that may demonstrate that deregulation may have created new problems. Thus far, the problems have not been sufficiently salient to warrant a re-thinking of the relationship between the public and private sectors in energy policy. However, before long that situation might be reversed and the role of the state might again come to the fore of debates. The two problems can be summarised under two words: 'costs' and 'cushions'. They are directly related to one another.

In terms of physical costs, most of the period between 1990 and 2000 was characterised by lower energy costs. Oil costs were persistently below $20, for WTI, Brent and the OPEC basket, except for the brief period after August 1990, when Iraq invaded Kuwait and the UN embargoed Iraqi oil exports. Natural gas and electricity costs likewise were reduced. Indeed, the extraordinary economic growth in North America during the last decade was buttressed by reduced energy costs.

The first sign of change came in 1997. That was when infrastructure constraints first started to loom large, as energy demand growth hit against physical constraints. Oil prices rose to twelve-year highs in nominal terms, as WTI crude, which had averaged $19.30 between 1985 and 1996, and had scarcely risen above $20 a barrel after 1993, suddenly spiked to over $27 a barrel. Day rates for semi-submersible rigs in the Gulf of Mexico, which had averaged less than $10,000 a day in the late 1980s and early 1990s, rose to over $75,000. And OPEC, meeting late that year, virtually lifted all quotas. However, by late 1998 and early 1999, as demand bounced off constraints, oil prices

plummeted to $10 and the illusion that surplus capacities in the energy sector were endemic and permanent again came to the fore.

Yet since 1999 energy prices in North America – as elsewhere in the world – have been on an upward trajectory, most markedly in 2004, when gasoline prices peaked at an average of $2.10 a gallon and ended at $1.80, up 40 cents year-on-year. Diesel prices peaked at $2.20 a gallon, ending the year at $2.00, up 45 cents year-on-year. More stunningly, natural gas prices, which averaged $2 per million BTUs throughout the 1990s, climbed to an average $5.43 in 2003 and $6.03 in 2004.

Higher average prices, accompanied by occasional price spikes were a reflection of a second critical factor – the loss of surplus capacities, not only in North America but internationally as well. The erosion of capacity cushions became a major feature after 2000 along the entire energy chain. This included not just lost capacity to produce surged oil and gas and electricity. It also involved lost transportation capacity (both along pipelines and via tankers), and lost surplus refining capacity (both in terms of gross distillation capacity and, equally importantly, lost flexibility to process an increasingly sour and more heavy crude slate into increasingly tighter product specifications, especially for transportation fuels).

Lost cushions have reflected two converging trends. On the one hand, they reflected the erosion of surpluses that had been created through over-investment a generation ago, at the end of the 1980s and the 1990s. That erosion also reflected industry-wide under-investment due partially to low financial returns in refining and the upstream, and partially to an unanticipated surge in demand growth globally in recent years. But, on the other hand, the lost cushions and flexibility in the energy chain reflected the retreat of government as regulator and guarantor that adequate supplies were available to meet anticipated demand. This was especially true with respect to power generation, where the benefits of deregulation and the withdrawal of state interference were thought to bear permanent benefits, because when deregulation occurred no one doubted that fuel supplies would be adequate to fuel electricity generation.

The illusion that liberalisation would bring permanent tangible benefits was reinforced by the growth of the North American energy trade, both between the USA and Canada and between the USA and Mexico. Since 1990, global oil consumption has increased by 12.9 mmb/d, with US demand rising by about 3.3 mmb/d, or 25% of the total. But because US domestic production has also slipped, US imports rose by 4.3 mmb/d over this period, more than 30% of the total increase in world oil trade. Canada and Mexico benefited substantially by this growth in consumption and by the openness in markets fostered by the North American Free Trade Agreement, launched in January 1994. Canadian production during this period grew from 1.96 mmb/d to 2.99 mmb/d, and its exports, virtually all to the USA, increased from 0.96 mmb/d to 2.1 mmb/d. Mexico's production base grew from 2.98 mmb/d to 3.79 mmb/d and its gross exports (again virtually all to the USA) grew from 1.39 mmb/d to 2.12 mmb/d.

The benefits of rapidly increasing energy trade in North America have both strengthened the view that deregulation of markets alone brings benefits without costs and bolstered the view that the energy sector was governed essentially by market forces. Both are illusions. The first one is resulting in the postponement of any sensible debate about the role of the public sector in assuring that the energy sector has the flexibility required to meet public needs and to rapidly adjust to changes in underlying conditions. The second is perhaps even more dangerous. It jeopardises the public good by its failure to understand that in energy, and especially in oil, the dramatic role played by the state in certain oil-producing countries is itself a factor in the lost flexibility of the system to adjust to change. And it is especially obvious in the southern part of North America. Mexico continues its state monopoly over its hydrocarbon sector. This is a factor that not only makes full liberalisation of trade and investment in energy in North America impossible. It also brings costs to Mexican citizens as well as to the Mexican government by limiting the growth of that sector which would be accompanied by open investment.

There were numerous times in the recent past when the USA might have taken action to thwart government control over the energy sector in supplier countries, a factor which lately has created a weird situation, especially in this age of globalisation and liberal trade and investment. Today OPEC countries and Mexico fail to convert their abundant resources in the ground into proportional market share. Yet they have nearly unlimited trade and investment access to oil importing countries. In the mid-1980s, at the peak of OPEC surplus capacity, and again right after the Gulf War in 1991, Washington might have used the muscle associated with the size of its market. It could have required those exporters wanting access to the US market and ownership of part of the US refining sector to re-open their own markets to foreign trade and investment. Such a re-opening would have brought more of the fruits of globalisation to producer countries and would have resulted almost certainly in higher economic growth for all countries, including the producers, and lower costs to consumers. That is a potential lesson that may haunt future governments in the West.

What other lessons might there be in the experience of the past decade and a half? Here is a brief overview of some of the more noteworthy lessons.

Washington, like Ottawa and the capitals of most other OECD countries, has made domestic energy policies subservient to other governmental goals, especially environmental policy. In the case of the United States, Congress, with Executive branch acquiescence, has granted the Environmental Protection Agency responsibility for administering the Clean Air Act and other environmental laws and regulations. The problem has been that the mandates of these

acts enable the EPA to be free from responsible reporting to Congress or the President. They have also enabled a group of technocrats to dictate fuel standards, emissions controls, and other core aspects of energy policy without regard to any sensible cost versus benefit analysis of its actions. This has brought costs to the industry and to citizens, which can be dealt with only if the legislative and executive branches find a way to reassert the authority and responsibility of elected officials in formulating and implementing policy.

"The illusion that liberalisation would bring permanent tangible benefits was reinforced by the growth of North American energy trade"

Similar conclusions can be drawn from a review of the administration of the Strategic Petroleum Reserve. The US SPR is approaching full capacity of 700 million barrels, and it might well be enlarged in the years ahead. The SPR is the most significant tool in the armour of government for dealing with energy issues. For more than a decade, until the election of George W. Bush, various administrations have insisted that the SPR should be used as a last resort to deal with physical disruptions of oil supply. Yet, each administration has found a way to release SPR oil to damp prices when speculators pushed them well above market-clearing levels. Until recently, it was costly for funds to go long above $35 a barrel, because of the ambiguities inherent in US SPR policy. But now an administration has, for essentially ideological reasons, ended that ambiguity and made it clear that there is virtually no circumstance in which it will release oil from its strategic stockpile, reserving that oil for a rainy day to come. As a result speculators have been free to drive prices well above $35 a barrel. It seems clear that there are lessons in what the Bush administration has *not* done with the SPR, which will also enter future public debate.

In yet another area, the last decade and a half has witnessed the rise of two new energy superpowers, each of which is set upon pursuing what diplomatic historians used to call 'revanchist' policies. Neither Russia nor China likes the status quo. Russia is likely to stand some fifteen years from now alongside Saudi Arabia and other Middle East exporters, and alongside Nigeria, Angola and some West African exporters, as one of the three major sources of oil and gas in the world, and one of the only suppliers with global reach. China is likely to stand alongside the USA as one of the two major markets, both in terms of size and growth potential. Yet Washington has preferred to ignore these trends. It has done little to try to induce Moscow into playing by liberal trade and investment rules and has done even less to integrate China into the importing nations safety net of co-operation within the IEA. This, too, may turn out to have been a mistake and, a decade or so from now, there will likely be recriminations in Washington about what might have been done to ensure that the goals pursued by Moscow and Beijing were more congruent with Washington's.

The debate over dependence upon foreign sources of hydrocarbon supply and over vulnerability to supply disruption re-emerged after the events of September 11, 2001. But the debate has not awakened sustained public interest. Three elements of the debate remain particularly obvious arenas for future discussion and could well form the core of a new energy policy consensus. These relate to (1) LNG imports; (2) rampant demand growth for oil as a transportation fuel; and (3) the quest for energy self-sufficiency.

With respect to LNG, there is little doubt that official Washington has taken measures to ease the siting of regasification facilities to ensure ample supplies of natural gas. Yet, there has been no debate over the costs of increased dependence on foreign supplies or about measures that might be taken to ensure that higher gas import dependence does not translate into higher vulnerability.

When it comes to demand, Washington (along with Ottawa and Mexico City) remains the major exception within the OECD when it is necessary to take measures to damp demand for oil as a transportation fuel. Yet half of the increase in US imports over the past decade and a half (which equal to total oil consumption of all countries in the world except China and Japan) is due to rampant, if not wanton oil demand growth. At some point, if costs continue to rise, actions to increase radically the efficiency of the US automotive fleet must once again come to the fore of public debate.

With respect to self-sufficiency, or regional sufficiency, it remains an obvious fact that the United States is robustly endowed with coal. The public pursuit of clean coal technologies and of technologies to transform coal via liquefaction and gasification into the other fuels, will almost certainly re-emerge as the appropriate roles of the private and public sectors are examined.

Finally, perhaps the most intriguing element of the emerging debate within the United States on energy policy has been the extraordinary convergence between the political left and the right. It is borne from the right-wing neoconservative desire to free the USA from dependence on Middle Eastern oil and from the left-wing desire to foster soft and alternative fuel technology paths. Green Conservatism, for lack of a better phrase, may well be creating the basis of a new energy consensus in the USA. That consensus begins with the perceived need to end relentless growth of oil demand in the USA, because of the consequences of that growth with respect to physical and foreign policy dependence on Middle East countries, and on Saudi Arabia in particular. It includes a Green strategy as the way toward energy independence, which is based on essentially national security goals. The increasing contacts between these two groups may indeed provide the most lasting lesson of the recent past few years, especially the years since 9/11.

Asinus Muses

Sixty

We have a quorum
For Forum
To celebrate
Its sexagenate

In Perpetuity

IEA has just celebrated its 30th anniversary and OPEC is getting ready for its 45th. Asinus is reminded of that admirable adage, which says that 'If something can't go on for ever, it won't'. But, of course, it doesn't apply to institutions with secretariats.

Colour-coded

Asinus likes the idea of attaching colours to subsea pipelines. We already have Bluestream and Greenstream, and surely Blackstream (Black Sea to Aegean) is imminent. What a pity that the Interconnector wasn't coloured before it got named.

Derivative Illness

It's good to see that Nymex is opening an open outcry trading floor in Dublin but, to those who don't understand these things, the conflict between shouting and electronic trading is mysterious. Maybe the decision depends on whether you prefer a sore throat or radiation.

Dirty Money

HSBC says it will plant trees all over the world and thereby become a 'carbon-neutral' bank. Asinus had no idea that ATMs were so environmentally harmful when emitting banknotes.

Confusion

The latest news on the ITER front (the Nuclear fusion research programme whose delay was noted in Forum 56) is that they are still, a year later, arguing as to whether it should be located in Japan or France. Is this an example of potential international fusion that may go nuclear?

Hot Work

Research at Cornell suggests that you type faster and more accurately if the room in which you work is heated to 25C rather than 20C. Asinus can't work out whether it is more politically, or environmentally, correct to save heat or increase efficiency.

Waste Disposal Units

The Composting Association suggests that, instead of doing it at the end of the garden, organic waste should be put on farmland where it will create a 'sink' and reduce CO_2 emissions. But has it consulted the farmers? They may be less than excited to find sacks of potato peel left on their fields.

Bottle Bank

The Industry Council for Packaging in the Environment (how many people does it employ in how many branches, Asinus wonders) says that a family will save more energy by swapping its SUV for an ordinary saloon car than by recycling all its bottles for 400 years. But for how many years is this family expected to keep its car on the road?

Heated Discussions

Over 5000 people went off to Buenos Aires for this year's climate change conference as a follow-up to Kyoto. Asinus wonders how much CO_2 they emitted getting there and keeping themselves cool, and how this can be expressed in conclusions per delegate tonne of global warming.

Wired Up

Asinus hasn't yet got round to installing a GPS system in his car, but now that he has learned about WiFi he is postponing it further. He understands that WiFi will enable cars to communicate electronically with each other by bouncing information from car to car so that they can automatically alter their direction or speed to escape traffic jams or accidents. Who is going to get the driving licence – the car or the driver?

Grid Unlocked

The latest estimate for connecting all that free and environmentally pure wind (once the turbines have been subsidised) into the UK grid has gone up to £1billion, says Ofgem. No doubt the cost will, like most millennial projects, continue to escalate, but at least the price of wind, if not its quantity, should remain constant.

MBA (hol)

Asinus welcomes the idea of an MBA in Humanistic Management, which is being set up by the Manipal University, India, and the Ayurvedic Company of Great Britain. He wonders which financial institution will be the first to award its executives a year-end holistic bonus, and what it will be worth.

The Economics Reality Show

Asinus has never been good at theoretical economics, but he was more than usually disoriented when, reading about real business cycle theory, he was told that a business cycle was the equilibrium outcome of rational decisions made by millions of perfectly informed individuals. Oh well, he was always aware that his circle of friends was limited.

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