

As oil prices began to rise above the \$90 per barrel level and came within a spitting distance of the magic \$100 number, increasing numbers of people are asking: Why? Paul Horsnell, in an article remarkable for its brilliant and original interpretation of oil prices determination, provides an answer. Oil prices are not like a cake made up of different layers, in this case premia for such things as geopolitical fears, financial speculation and so on. It is rather like a toddler who roams around trying to see how far it can go until somebody or some harsh reality stops him. So far the 'harsh realities' of supply and demand have not signalled any danger. And there is much more than that to think about in Paul's paper.

As usual, we have in this issue articles grouped under two broad themes. The chosen ones here are (a) the security of oil supplies, a problem that occupies many officials in many countries, and (b) the environment, a topic that concerns much broader audiences.

Paul Isbell identifies the threats to oil supplies, distinguishing genuine from bogus fears. He groups them according to the time horizons – short, medium and long term – over which they may arise, and he has sober views about the nature of various threats and the appropriate policies needed to deal with them. John Gault sees the gas supply issue from another angle, that of the apparent contradiction between two trends in Europe. One is the liberalisation of energy markets, and the other, the entry of foreign gas suppliers in Europe's downstream. The

first trend is meeting resistance from some Member States and the second is meeting obstacles from the EU itself. Gault believes that the two should be encouraged as they are not only complementary but both can increase supply security.

The security issue is of significant concern to the IEA and OPEC – that is to both importers and exporters of oil or gas. The authoritative views of these two major institutions are presented by top officials of the respective organisations, William Ramsay, the Deputy Executive Director of the IEA and Hassan Qabarzad, the second in command at the OPEC Secretariat.

The second set of articles tackles different aspects of the complex environmental issue. Measures to deal with climate change are being negotiated internationally, introduced nationally and endlessly discussed.

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Many involve burdens and costs to be carried by nations different from one another in a variety of ways. Some are poor and others rich. Some have contributed massively to the historical accumulation of CO₂ in the atmosphere, others did not in the past but are now significant polluters. What are the ethical issues that the distribution of burdens involves? Professor Simon Caney addresses this difficult issue with deep insights.

A specific ethical issue is raised by Benito Müller, that popularly known as the food miles question. Should we buy beans from Kenya or strawberries from South Africa if we are concerned about the environment? Flying the stuff over thousands of miles adds to emissions. If you want to know why the answer is enjoy the beans and the strawberries read Müller.

How can we curb emissions? The choice seems to be between measures that focus on prices (like carbon taxes) or on the volume of emissions (quantity caps which also enable trade between those who can reduce their emissions at lower costs than others). Robert Ritz compares both. In the perfect world of theoretical economics where there is full information available to everybody the two types of measure would yield equivalent results. We mercifully live in an imperfect world; life would be exceedingly boring otherwise. The two types of measures need therefore to co-exist leaving to the long term the task of operating a convergence.

There is actually an emission cap and trade scheme in operation in Europe since January 2005. It is the EU Emission Trading Schemes (EU ETS) which Paul Newman defends while recognising certain flaws that, he argues, are likely to be removed in the second stage. The first stage was a test bed. It is unfortunate that it involved a sudden price collapse in May that caused a loss of confidence. But traders recover quickly from such shocks, and it is not difficult to understand that they prefer getting on with trading than being burdened by taxes.

A critical question for international cooperation on climate change is whether China, India and Korea will accept treaty defined emission caps. Meetings in Bali in December 2007, the last before the Kyoto Protocol comes into force on January

1, will centre on caps for the second period starting in 2013. Liz Bossley argues that Non-Annex 1 countries which have not agreed to caps have nevertheless contributed to efforts to mitigate climate change. She suggests that a good solution is for a number of Non-Annex 1 countries to introduce domestic emissions trading schemes outside UN control but to date Kyoto and other allowances are not interchangeable.

Forum has always been intended to be a debating journal. We are very happy to have a letter from Paul Newman on the Middle East sour crude contracts, and an important addition to views expressed in *Forum* 70 on the access to oil reserves issue contributed by Robert Dudley.

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Security of Supply

Paul Isbell revisits the energy security debate

Oil prices are now surging towards US\$100/bbl and the world economy is poised delicately on the edge of a new slowdown, perhaps (or not) as a partial result of record prices. With consumer nations increasingly uneasy in the face of a new wave of energy nationalism, and with the world plunged into an orgy of drama over global warming, the debate on energy security is raging once again.

Energy security is a concept notorious for its vague and slippery nature, no less so because it is bound to mean different things at different times to different actors within the international energy system. Perhaps it would be convenient to analyse some of the most basic sources of 'energy insecurity', dividing them into short-term, mid-term and long-term issues.

Short-term Security of Supply

At the top of the list comes the threat to short-term security of supply often perceived in energy-importing economies. This is not a new concern: the world's first contemporary energy crisis occurred with the 1973 Arab embargo on oil to the USA and Holland. Recently, a perceived threat has caused increasing anxiety in EU countries ever since the brief disruption of Russian gas to the Ukraine in January 2006 and oil to Belarus at the beginning of 2007. This fear has been rekindled by Gazprom's recent ultimatum to halt flows to the Ukraine if debts were not promptly paid. All three crises were diplomatically resolved in quick order, but the concern over security of supply from Russia remains alive in Europe.

In theory, a supply cut could cause severe and even lasting damage to an importing economy. In certain cases, particularly involving economies

highly dependent on a single source of imported gas arriving by pipeline, a sustained cut-off (of a month or more, especially during the winter) could even provoke social panic and political chaos. But so would an aggressive act of war. The important questions to ask, therefore, are: (1) Is there any real likelihood this might happen, short of the outbreak of war? (2) Are we certain we are correctly reading the motives and capacities of those countries we fear are inclined to behave in such a manner? (3) What is the most appropriate policy stance of an importing country in the face of short-term supply cuts, however unlikely?

Almost all major producers are highly dependent on energy. This dependence typically entails a very large contribution of the energy sector to the GDP, a high percentage of energy exports in total export earnings, and a large percentage share for energy income in total government revenue. In the case of Russia, for example, hydrocarbons account for over 20 percent of the GDP, 65 percent of export earnings and approximately one-third (if not more) of the federal government's revenues (Gazprom alone accounts for 25 percent). In most relevant cases, this dependence is high enough to create a mutual dependence between energy exporters and importers. This is true for Russia and Europe, as it is true for Venezuela and the USA. It is also true for Algeria and Spain, as it is for the Persian Gulf exporters and East Asia. The highly interdependent nature of the world energy system goes a long way toward eliminating the real likelihood that premeditated supply cuts will be used to damage importing economies during peacetime. Commercial and state diplomacy can, and always have, taken care of the relevant residual risk.

Still, a number of potential situations might lead to supply cuts, despite the interlocking realities of mutual dependencies. It is essential, however, to understand the true nature of such

disruptions, and the motivations – if any – behind them. Indeed, most oil flow disruptions have not been premeditated, at least not by any state or company officials in charge of flows. Rather they have been the result of refinery accidents, pipeline problems (BP in the USA) or weather events (Hurricane Katrina). The rest have typically been the result of local unrest (in the Niger Delta or the 'great strike' at PdVSA) or geopolitical instabilities (Iran and Iraq). Even the risk of terrorist action against critical energy infrastructure (like the failed attempt to blow up the massive Abqaiq facility in Saudi Arabia) is higher than those stemming from the geopolitical use of supply cut-offs. Given the technical complexity of the world energy system and instability of international geopolitics, these are real risks, unlikely to go away easily or quickly.

Oil. As it is, the world oil market – being relatively unified and fairly liquid in a fungible commodity – is the one energy sphere best prepared to absorb such shocks and spread out the risk, as all such cut-offs have been mediated – and broadly distributed – by the price mechanism. Even in the case of the Arab oil embargo, the global market performed its function of efficiently redistributing flows. Neither the USA nor the Dutch economy experienced a significant lack of oil as a unique result of the embargo, as oil flowed in different directions and the market adjusted. The significant price increases that occurred simultaneously, on the other hand, reached around the globe and stemmed not from the embargo but rather from the coordinated production cuts implemented by Arab exporters at the same time – an altogether different matter.

With respect to a premeditated oil supply cut-off, a key question to ask is whether the event implies a lasting net loss of oil to the market, or whether it merely represents a diversion of flows to other destinations. In

the former case, the result will be an increase in the world price of oil paid by all consumers, not just those in the supposedly ‘targeted’ country. In the latter case, although there might be a temporary price increase while the market readjusts the direction of flows, the ultimate impact will be ephemeral. The implication of this is that while Venezuela’s plans to divert oil exports from US destinations to China, for example, may grab headlines, they will have little if any real impact on US energy security. On the contrary, such projections are mere ideological posturing designed to send messages into various ‘political market places’.

Gas. Admittedly, the case of gas is different. More than 70 percent of the world’s traded gas still flows within regional (not global) markets, in the context of bilateral long-term contracts, by way of inflexible pipeline networks with their fixed points of origin and destination. Therefore, even the unlikely event of an extended gas disruption – intended or not – does pose more concentrated risk to the relevant importer than an equivalent oil disruption. This unique characteristic of gas is unlikely to be transformed for several decades, and only if a dominant global market in liquefied natural gas (LNG) – a product traded globally today but still nearly exclusively within the context of bilateral long-term contracts – develops along lines similar to the current world market for oil. It should be noted, however, that even in such a future scenario, globally traded LNG will be at least as vulnerable to disruptions from local and regional instabilities as oil has always been.

With respect to a disruption in gas supplies from Russia, for example, to its former brother Republics of the defunct Soviet Union, there are different questions to ask. What is the nature of Russian motives for the disruption of supplies? How likely is a serious Russian gas cut-off, particularly given the country’s dependence on European markets and its desire to see Gazprom penetrate the downstream?

There is undoubtedly a political element in many of the Kremlin’s actions in the energy realm. The re-nationalisation of the hydrocarbons sector clearly has been pushed by the Kremlin–Gazprom tandem. For Russia, the energy sector is obviously perceived to be ‘strategic’, representing as it does not only much of its current geopolitical leverage but also its greatest source of export earnings and government revenue. But none of this necessarily represents a security of supply risk, particularly not for Europe. One could argue that Russia has used energy as a lever in its relations with the Balkans and the Caucasus, but such behaviour reflects a realignment of Russian influence in the former Republics after a long period of continual loss of relative power vis-à-vis the former periphery in the wake of the Soviet collapse. Such developments are to be expected. Trying to meddle in Russia’s near abroad with the objective of blocking them will achieve little and ultimately only makes Europe’s misguided security of supply fears all the more relevant, given the likely Russian reaction.

“Consumers also need to be made aware of the real issues involved, ... as opposed to simply being led to believe there is a foreign demon on the horizon”

Curiously, the gas disruptions that have shattered European confidence in the reliability of Russian supply have not been the arguably political incidents of the Baltics or the Caucasus, but rather the Ukraine and Belarus episodes. These cases, however, should be understood as commercial disputes (like the case of Bolivian export prices to Brazil and Argentina, or the recent Algerian–Spanish tug-of-wars). As international price conditions have dramatically changed in recent years, some upward adjustment in export prices is only natural (as is a

toughening of access and financial conditions in producer energy sectors). That Russian diplomacy has been heavy-handed is one thing (and the brinkmanship of the former Republics no less clumsy). To assume that Russia was also consciously sending a message to Europe is altogether another, and far less credible, claim.

The Kremlin is no doubt delighted at the security of supply hysteria that has engulfed Europe in the wake of these incidents. European fears have given an unexpected boost to perceived Russian influence, but this was not a central concern of Gazprom’s diplomacy. Furthermore, it does not suggest that Russia will seriously contemplate using the supply weapon against Europe in the future. If anything, the tussles with the former Republics explain Russia’s desire to diversify gas transport routes to Europe, with projects like the Nord Stream pipeline designed to side-step transit countries whose prickly relations with Russia might continue to effect flows, however fleetingly, to an increasingly sensitive Europe.

Policies. In light of the above, what policies are appropriate for import-dependent countries? First, sufficient stockpiles (both strategic and commercial) should be maintained. This is an obvious policy that is pursued, at least for oil, in most consuming countries. Gas stockpiles are a trickier issue, given the geological requirements (which some countries lack) and the significant capital costs involved (that someone must front). In the case of the EU, adequate gas stockpiles are theoretically possible, given sufficient planning for inter-country solidarity in the case of disruptions and adequate pipeline interconnections. Consumers also need to be made aware of the real issues involved, within the context of emergency planning and demand management, as opposed to simply being led to believe there is a foreign demon on the horizon. Perhaps there is also a role for NATO and other international security structures to play in the protection of vital energy infrastructures and maritime energy transport.

The appropriate response then is infrastructure investment, emergency planning, credible solidarity mechanisms, demand-management and consciousness raising, not diplomatic brow-beating of producer countries, or panic and reaction politics among consumers. Perhaps one day Russia and Algeria will conduct business in a manner more amenable to EU standards, but that possibility is much more likely if such countries are dealt with today as they are, as opposed to how one wishes they might be. It might even make sense to consider downstream access for NOCs. This tighter (if not yet reciprocal) mutual dependency will only make the EU more secure in energy terms and will likewise have a positive impact on the economic stability of producer countries, something that might actually bring forward the day when their energy sectors begin to open up to third-party access within the context of more open and competitive domestic economies.

Mid-term Security of Production

A much greater risk is the threat looming in the middle run that the rhythm of energy investment falls short of that needed to continue to produce and deliver to markets sufficient hydrocarbons to meet projected demand. This mid-term security of production risk stems from the politics of so-called 'energy nationalism'. Indeed, one of the paradoxes of the current energy debate is the likelihood that supply bottlenecks with political origins will impinge upon markets long before any geological limits impose themselves, making the debate on 'peak oil' all but irrelevant.

Baseline projections for total world energy demand foresee a 50 percent increase between 2005 and 2030, with oil demand reaching 115mb/d. The IEA has projected that more than US\$20 trillion in investment will be needed across the world's energy sectors to satisfy such demand (and US\$4 trillion alone in the oil sector). What is more, this estimate rose from US\$17 trillion just two years earlier. Fatih Birol, the IEA's chief economist, has also claimed that since 2004 the

world has fallen 20 percent short of the necessary annual rhythm to meet such a target.

We might assume that the task could be managed by the international energy industry. However, given recent developments, this seems optimistic. The IOCs have full access to something less than 15 percent of the world's hydrocarbon reserves and potential partial access to something more, while NOCs arguably control more than 75 percent. Against this backdrop, the future investment climate has been clouded further by what one might call the 'internal' aspect of 'energy nationalism' (as opposed to the 'external' use of energy exports as a geopolitical tool), including unilateral tightening of access conditions (i.e. for Shell in Sakhalin and BP in Kovytkka) and the imposition of more restrictive fiscal and royalty conditions on IOCs (i.e. for companies operating in Algeria and the Andean zone, to say nothing of those operating in Canada's Alberta tar sands).

That leaves much of the future supply question in the hands of NOCs. But will they be allowed to invest enough of their profits in sufficient exploration and production, given the competing budgetary priorities of many of their governments? And will they be capable of wielding enough technological and managerial capacity to bring enough oil and gas to markets over the middle run to meet demand without prices rising exorbitantly? Given the track record of most NOCs and producer governments, one has many reasons to be sceptical. The IOCs, on the other hand, may be successful with their technological gamble on more difficult and expensive hydrocarbons in ultra deep waters, arctic zones, and unconventional resources, but at the moment the balance of risks is still tilted toward the likelihood that world petroleum and gas production will increasingly struggle to meet demand.

Such a scenario may well play – in the form of higher prices – into what many producers perceive narrowly as their own economic interests. But given the world's hydrocarbon-

dominated energy mix, this implies energy insecurity for consumers in the form of future supply shortfalls and increasingly tight world energy markets. Furthermore, if higher prices eventually dent world demand in a significant way, or provoke a faster roll-out of alternatives, then the mid-run supply crunch brought on by a politically-induced dearth of investment may ultimately undermine the energy-based economic security of producers as well, particularly if the current impasse between producers and consumers continues to leave a vacuum of global governance in the international energy system. Finally, should energy prices collapse on the back of an international economic crisis, the finances of many producer countries, still overly-dependent on hydrocarbon exports, will come under pressure, as will their political and social stability.

Perhaps a balance could return to relations between NOCs and IOCs. Much of the investment problem stems from swings in the relative balance of power between these two groups, and the different masters both must serve. In the 1990s, with oil prices low and IOCs gaining access to reserves in producer countries (at the time in the throes of globalisation-induced liberalisation), the 'shareholder value culture' of ascendant financial markets held IOCs hostage, checking their rate of new investment. In the current decade of high oil prices and widespread rejection of economic liberalisation, NOCs have clawed back their reserves. But despite (or because of) record revenues, their governments have increased their takes at the expense of both IOCs and NOCs, channelling funds into a number of uses – ranging from energy subsidies to social and military spending – that directly compete with energy investment.

In the end, IOCs may be needed again in many producing countries now engulfed in 'energy nationalism', if for nothing more than their technological and managerial capacities, if not their capital. Therefore, a new *rapprochement* between NOCs/producers and IOCs/consumers, based on mutual

trust and flexible contract arrangements, must be constructed quickly, if the looming investment shortfall and supply crunch is to be averted. This issue is far more important than the headline-grabbing concern for short-term security of supply.

Long-term Geopolitical and Environmental Security

But the gravest energy security threats await us in the long run, overshadowing any challenge the international community has ever had to face. The first is that 'energy nationalism' will continue to guide not only producers but also large consumer countries. This could lead to further zero-sum behaviour on the part of China and other Asian countries, as well as Western powers like the USA, in a new nationalist competition for access to hydrocarbons. Despite the fact that internationally integrated energy markets, collectively regulated via international cooperation, would produce the most rational economic results, and the most optimum international security, further nationalist competition could easily infect the already complicated geopolitical scenario, making military conflict more likely. It would not be the first time that nationalist competition, fuelled by resentments and misperceptions, ran roughshod over the more optimal and rational arrangements of markets and international collaboration. The solutions – demand management, incentives for a faster rollout of alternatives, and the reconstruction of a functioning framework for multilateral collaboration and global governance – are clear. One wonders whether that will make a difference.

This first threat stems from the poisonous notion that external dependence necessarily undermines national security. The second threat – which could easily interact with the first – derives from dependence not just on *external sources* of fossil fuels but on *fossil fuels themselves*. The spectre of climate change is the real energy security threat facing the world. It is also the only energy security threat over which we cannot fool ourselves: for it is clearly a

collective security risk. In the end, so are all the other risks mentioned above, only we insist on dressing them in the trappings of 'national security'. As a result, they become misguided but self-fulfilling prophecies. But climate change dwarfs them all, and makes all 'nationalist' fears of Russian or Venezuelan or Chinese 'energy nationalism' pointless.

We need demand management, alternative energies, carbon-friendly technologies, market integration and true, sincere international collaboration. We can run from this conclusion if we insist – as indeed we have – but we cannot hide.



John Gault considers European security and natural gas supplies

Two distinct but seemingly contradictory trends in European natural gas markets will influence the security of natural gas supply for the foreseeable future. One such trend is the European Union's programme of gas market liberalisation. The other trend is the entry of foreign gas suppliers into the EU downstream market, primarily through joint ventures with established European natural gas companies. Each of these trends, according to its advocates, contributes to supply security.

Market Liberalisation and Supply Security

The original argument presented by advocates of market liberalisation was that competition yields lower prices. The compulsory sale of gas at the wholesale level, combined with third-party access to pipelines, would allow the entry of new companies and eliminate economic rents currently

captured by large integrated national monopolists or near-monopolists. The example of how telecommunications prices shrank following liberalisation of that industry is often cited.

Nevertheless, most EU members have been slow to implement market liberalisation measures, and some appear intent on protecting and even enhancing the dominant role of their national energy champions.

Recently, advocates of market liberalisation have argued that, in addition to yielding lower prices, it contributes to security of supply, because price signals will induce adequate investment in infrastructure at the appropriate times and places.

When evaluating these arguments, we have the advantage of observing two markets that have been liberalised: the United States since 1978 and the United Kingdom since 1986. Global energy prices have risen since then, so it is difficult to say whether natural gas prices in the USA and UK are lower today than they would have been in the absence of market liberalisation. We can note, however, that spot gas prices in these markets have displayed considerable volatility.

Particularly sharp spot price upswings occurred in the United States due to cold snaps in the winters of 2000–2001 and 2002–2003, and again in the autumn of 2005 when Hurricane Katrina knocked out natural gas production in the Gulf of Mexico. In the UK, an exceptional price peak during the winter of 2005–2006 resulted from an unanticipated decline in North Sea production and inadequate storage capacity, aggravated by a fire at the UK's largest gas storage field.

In these examples, sudden, sharp price upswings (reaching as high as double their pre-crisis values) induced fuel switching and factory shut-downs, and thereby obviated the need for government-imposed rationing. Had prices been capped and rationing introduced, these incidents might have been more widely perceived as examples of supply insecurity.

In theory, an expectation of sustained higher prices should induce investment in infrastructure. However, as

one can observe from the petrochemical industry, competition often results in cyclical investment peaks and valleys. At times, there is a surplus of capacity and prices are driven below long-run marginal costs. This situation continues until demand catches up with available capacity, prices rise, and a wave of investment occurs, resulting in renewed excess capacity, and so forth.

Some may argue that the large number of LNG receiving terminals under construction or planned in the USA and the UK demonstrates that liberalised markets ensure adequate, timely investment in natural gas infrastructure. Indeed, since the combined capacities of these terminals vastly exceed expected demand, some may argue that competition even guarantees that idle capacity will be available in emergencies.

Unfortunately, what we are observing is rather a speculative boom. Many of the announced projects will never be built, and to the extent that overbuilding ahead of demand occurs, the resulting low margins may serve only to deter further investment. The truth about competitive markets is that investors seek to invest in productive capacity, not idle capacity, and to the extent that idle capacity temporarily emerges it is the result of cyclical aberrations.

Not only do competitive markets fail to yield sustained idle capacity, they can easily result in inadequate capacity if other regulations impede investment. The slowness of approvals of new LNG receiving terminals in Italy and the lack of construction of any new grassroots refinery in the United States in decades both illustrate the degree to which local opposition and environmental regulations can delay market responses to price signals.

To the extent that sustained idle capacity is an essential element in ensuring uninterrupted physical supplies or avoiding exaggerated price swings, idle capacity must either be imposed by regulation, or provided directly by the government. Logically and most efficiently, the need for idle capacity would be defined and regulated at the EU rather than the national level, but

national governments appear reluctant to allow this to happen.

The EU Directive on natural gas supply security (2004/67/EC) instructed Member States to ensure supplies for household customers under specified critical circumstances, and created a Gas Coordination Group ‘to facilitate the coordination of security of supply measure[s]’. The Directive stops far short of creating an EU-wide plan to assure that sufficient idle capacity is available when and where it is needed in a crisis.

“Not only do competitive markets fail to yield sustained idle capacity, they can easily result in inadequate capacity if other regulations impede investment”

The Directive is, in the words of Energy Commissioner Andris Piebalgs in January 2006, a ‘watered-down’ version of the Commission’s original proposal: ‘Europe needs a clearer and more collective and cohesive policy on security of energy supply. To date, the issue of security of energy supply is only really considered at national Member State level; but in reality we need a much greater European-wide approach on this issue.’

In summary, then, the argument that market liberalisation improves supply security requires a number of significant caveats. Considerable work remains before the necessary architecture of European gas security is in place.

Foreign Suppliers’ Downstream Ventures and Supply Security

The parallel but seemingly contradictory trend is the entry of foreign gas suppliers into the EU downstream market, primarily through joint ventures but also, in a few cases, independently. Many of the joint ventures involve the same large European gas transmission and distribution

companies who are the targets of the EU liberalisation policy.

International natural gas trade has thrived for decades on long-term, take-or-pay relationships between exporters and importers. These bilateral relationships have been likened to a marriage, or to the two wings of an airplane, and in general they have endured and have served both parties well. With few exceptions, price renegotiations under such contracts have occurred without interruption of the flow of gas, with any agreed price changes being applied after-the-fact to gas delivered during the renegotiation period.

Cross-ownership of transportation facilities has frequently supplemented the contractual relationships. For example: ENI and Sonatrach jointly own the subsea portions of the Trans-Med Gas Pipeline, and Mitsui is a partner in the Abu Dhabi Gas Liquefaction Company (ADGAS).

In recent years, joint ventures up and down the gas value chain have become almost the norm in international gas trade. Some joint ventures focus on gas transportation and storage, while others include downstream marketing activities. Examples include Winterhall’s joint ventures with Gazprom; Sonatrach’s joint ventures to build the Galsi and Medgaz pipelines, and Qatar Petroleum’s investments in LNG-receiving terminals in Europe and North America. The Nord Stream and South Stream pipeline projects, joint ventures between Gazprom and European partners, also fall into this category. Many other examples could be cited.

Gazprom, in particular, has gone beyond joint ventures and is approaching some European customers independently. A subsidiary, Gazprom Marketing & Trading Ltd., acquired the retail natural gas business of Pennine Natural Gas Ltd. in the UK in 2006, and Gazprom has announced that its subsidiary Gazprom Marketing & Trading France, based in Paris, is selling gas directly to customers in competition with Gaz de France.

Foreign suppliers’ downstream ventures have met resistance on both the

national and EU level. The Spanish government initially decided to limit Sonatrach's direct marketing of gas in Spain to 1 bcm/yr (about 3 percent of the Spanish market), but later relented and abolished the ceiling. Italian regulators blocked Gazprom's first attempt in March 2006 to form a joint venture with ENI, and the head of Italy's Antitrust Authority was quoted as calling the companies' second attempt 'anticompetitive'.

The European Commission recently proposed to prohibit 'third country individuals and countries' from acquiring 'control over a Community transmission system or transmission system operator unless this is permitted by an agreement between the EU and the third country'. This prohibition would be additional to the unbundling requirements that would apply to all investors, European and non-European.

A contrasting position was UK Prime Minister Tony Blair's assurance, in February 2006, that the UK would not oppose a Gazprom acquisition of Centrica, following Gazprom's admission that Centrica was on a list of 'potential acquisition targets' in the UK. According to the *Financial Times* (25 April 2006) Mr. Blair believed 'that Britain must stick firmly by its commitment to liberalise European markets' and 'must face down the wave of "economic patriotism" shown by some EU states'.

An objective observer, when evaluating the costs and benefits of downstream EU investment by gas exporters, must take into consideration the following elements:

- International oil and gas companies have long recognised that, once they have invested upstream, their investments make them hostage to changes in host government policies. Should not foreign downstream investors in the EU, once their investments are in place and immovable, likewise find themselves motivated to comply with EU policies and provide uninterrupted service to EU customers? In this regard, the example of Venezuela's continued supply of crude oil to its own Cities Service

refineries and retail distribution network in the United States, in spite of President Chavez' oft-stated hostility to the United States government and his desire to divert exports toward other destinations, comes to mind.

- Natural gas exporters who find themselves in direct contact with customers in the EU will, as part of their marketing programme, become highly familiar with the needs of their customers. Such direct contacts will render service interruptions not merely abstract but highly personal events. The bad publicity and damage to the supplier's customer relations will be even more severe than was the case as long as a purely European company served as intermediary.

Outward foreign direct investment (FDI) from transition and developing countries is increasing rapidly. Total FDI from these countries expanded especially rapidly in recent years, reaching \$210 bn or about 17 percent of global FDI in 2006. Russia was the third largest source of FDI outflows from this group of countries in 2006. As these countries' foreign investments expand, the need to protect their investments will similarly grow and their interests will be more closely aligned with those of the traditional capital exporters: the USA, Europe and Japan. As a consequence, they will become increasingly interested in negotiating bilateral investment treaties (BITs). By definition reciprocal, BITs typically provide for national treatment of foreign investors and for international arbitration of investment disputes. The number of BITs has been expanding rapidly; at the end of 2006, 174 countries were parties to 2572 BITs, up from 1097 in 1995 and the Russian Federation was a party to 52 BITs in 2004, compared with 31 in 1995.

Which Trend is more likely to yield Security of Natural Gas Supply?

Although the two prevailing trends – market liberalisation, on the one hand, and foreign suppliers' advances downstream, on the other – may seem contradictory, in fact they are not, for

the concept of market liberalisation implies a free flow of investment from all sources, both domestic and foreign. Indeed, the entire premise that free markets will induce appropriate and timely infrastructure investment assumes such free flows of capital.

In the long run, the EU will implement a mix of policies that achieve enhanced security via *both* a liberalised but regulated internal market, and exporter-importer joint ventures in infrastructure. In the near term, however, which trend is more likely to provide the greater contribution to Europe's natural gas security?

Taking into consideration the slowness of the market liberalisation process and the apparent reluctance of Member States to cede market-regulating power to the EU, it may take a while before the alleged security benefits of the free market will be realised. Meanwhile, the joint ventures of foreign suppliers with EU companies are advancing rapidly to implement the needed infrastructure projects. It would seem, from a security perspective, a pity to throw additional obstacles in the paths of these projects.

In particular, it would be counterproductive and inconsistent to apply more strict rules, particularly concerning allowable market shares, to foreign suppliers than to domestic companies. If market liberalisation is to be introduced, it should be accomplished in an equitable manner. EU-based companies entering upstream operations in oil- and gas-producing countries have long argued for a level playing field with host-government national oil corporations (NOCs). The reciprocal situation should apply downstream.

This paper was prepared for the seminar on Energy and Global Security: Towards a Cooperative Approach held in Gstaad 14 September 2007



William C. Ramsay discusses security of energy supplies in a global market

Energy security remains a core issue for the IEA as it was thirty years ago when the Agency was created, just after the first oil crisis. The energy world has changed significantly since then. The oil market has completed its globalisation; yet security concerns today are not only about oil but also about gas and electricity. The sharp division between the Western and Eastern blocs has in large measure disappeared; OPEC and the IEA and their respective members have found considerable common ground; countries outside the OECD such as China, India and Russia, have become increasingly important in world energy balances; and climate change looms as a major factor shaping energy policy.

Despite all these changes, the essence of traditional energy security remains the same: diversity in the fuel mix, geographic sources of supply and market participants; and a safety net for short-term supply disruptions.

The Medium Term: Energy Efficiency and Investment in Capacity

To start with the medium term: the risks to the world's energy security are growing, because more and more oil and gas are being traded over increasing distances, production of oil is inevitably concentrating in fewer countries and gas will eventually do the same. Many of those oil and gas provinces have been the source of insecurity in oil or gas supplies; other producers live in neighbourhoods prone to political turmoil. Oil production in OECD countries will plateau soon, as it will in other consuming countries, making them more and more dependent on imports. Net-imports of the OECD, China and India in total will rise from around 33 mb nowadays, to some 54 mb in 2030. And the share of natural gas being

imported will also rise dramatically.

Importing energy is not a problem per se. We need to recognise that, for most of the IEA countries, energy self-sufficiency or 'independence' is an illusion. Markets are sufficiently integrated that price spikes in oil and increasingly in gas, will transmit everywhere. Most consumers are exposed to these price fluctuations and where they are not, central budgets are. But that's not to say that we can do nothing. The first way of reducing our vulnerability to energy prices is to improve energy efficiency. Every barrel we do not have to use makes us more secure; with side benefits of saving money, combating local environmental issues and lowering GHG emissions. There is no lack of awareness about efficiency options – merely an inexplicable delay in taking them up. These are the energy policy 'no-brainers' that are only now, after a seven-year sustained high price environment, beginning to be recognised as embarrassingly obvious.

But even much improved energy efficiency will not make up for all expected growth in energy demand. Fundamental to medium-term energy security is adequate and timely investment in capacity to meet projected energy needs. Currently the most urgent challenge in the oil, gas and power sectors is to increase investment to boost capacity across the energy sector up and downstream. We have concentrated too long and too single-mindedly on economic efficiency and competition without due regard for the market's weakness in delivering security – or environmental public policy objectives. Those objectives require different signals to markets.

Now, since late-2002 spare oil production capacity has fallen below the 3–4mb/d that has traditionally been regarded by many analysts as a key barometer of market tightness, and well below the average levels of spare capacity evident in the past decade. With a number of potential supply disruptions haunting the market, a lack of spare capacity – in other words, upstream investment – is one key factor behind recent high prices. The market needs confidence

that suppliers will fully and quickly replenish any stock draws that may be seen this winter (as spare capacity in producing countries provides an additional buffer) and continue to listen carefully to market signals. This is especially the case as suppliers appear to have decided they would rather exercise control at the level of flows of oil to regulate the market than rely on stocks in end-user markets.

Another mid-term concern is the lack of investment in appropriate downstream oil refining capacity: demand growth is concentrated in the transportation sector and our trends in crude quality and spare refining capacity are increasingly out-of-synch with modern fuel needs. Increasingly rigorous and constantly changing sulphur regulations mean that the incremental barrel of oil is seldom the one refiners would have chosen to refine. In many countries environmental and planning regulations, public opposition and shortages of skilled labour and raw materials are making it increasingly difficult and expensive to build new refineries. All of this is in addition to the fact that over recent years the refinery business has not been a very good place to make money. With better margins recently, that may be changing.

Unless oil sector investment in both the upstream and downstream increases these constraints will remain and prices will continue to be under pressure. Oil prices have surged more than 30 percent this year to a record of nearly \$88/bbl in late October, reflecting a number of concerns including a tightening oil market this winter. These prices, of course have an impact on economic growth and therefore, on people's standards of living, notably in the third world, transition economies and on the fragile edges of the first world. Robust world economic growth has been masking many of the costs of these higher prices and in some places subsidies to consumption have removed the incentive to reduce demand and balance the market. While subsidies are intended to cap retail prices for fragile consumers, their increasing burden on national budgets means

lower spending on education, health and social infrastructure. The IEA estimates subsidies outside OECD countries at \$250 billion per year.

Short-term Insurance

Geopolitical risks have always existed and always will. Short-term policies and measures, such as the IEA collective action mechanism – the coordinated use of energy stocks, redirected supply flows and demand-side management – are intended to respond to supply emergencies. The co-ordinated emergency response measures to Hurricanes Katrina and Rita put in place by the IEA in September 2005 revealed the effectiveness of collective action in facing sudden supply disruptions, assuring deliverability in the oil markets and helping to bring prices down.

The devastating hurricanes of 2005 also demonstrated that, in today's market, the severity of an oil supply disruption is not only a function of the oil lost. It also relates to the level of commercial stocks, the likely duration of the disruption and the availability of spare production capacity. It is now apparent that at times when the world market has limited excess capacity, a relatively small disruption or threat of a disruption can have quite severe effects. Today, IEA dialogue with OPEC in times of market stress has reflected our mutual concern about stability in oil markets by allowing a tailoring of the strategic response to a supply disruption to the market's inherent ability and willingness to deal itself (in whole or in part) with the shortfall.

Stockdraw is the most important mechanism available to IEA countries during an oil supply disruption but not the only one. Demand restraint and fuel substitution remain important. However, switching to other fuel sources in an emergency has become limited in scope. In the transport sector, the potential for fuel switching is inconsequential due to the lack of alternative transport fuels in the short run. In the electricity market, the high level of substitution of natural gas for oil in electricity production means that the traditional 'alternative' fuel

is already in high demand and not readily available. In fact, switching to oil (from natural gas) may now be an appropriate response for a supply disruption in the power and heat sectors. This integration raises an additional question about fuel switching during oil supply emergencies – i.e. whether a supply disruption in one fuel, such as natural gas, can spill-over into the oil market and cause severe oil demand increases, and vice versa.

“We have concentrated too long and too single-mindedly on economic efficiency and competition without due regard for the market's weakness in delivering security”

The IEA is increasing cooperation with China, India and other emerging energy powers to promote the growing effectiveness of emergency response capabilities worldwide. Oil consumption outside IEA member countries will increase rapidly in the coming decades. The IEA *World Energy Outlook 2007* predicts that global oil demand will increase from 83.7 mb in 2005 to 98.4 mb in 2015 and 116.3 mb in 2030. Some 43 percent (13.9 mb in absolute terms) of this increase will come from China and India alone. Today, these countries are already major net importers, with a combined net import of around 5 mb and both are acutely aware of their exposure to volatility in world oil markets. For this reason, the IEA is promoting dialogue and information sharing on oil security policies and measures with China and India, and with countries belonging to the Association of Southeast Asian Nations (ASEAN).

But recent events have demonstrated the need for greater awareness and preparedness for supply tensions in gas and electricity. We have already seen technical, terrorist, meteorological and political disruptions to gas supply and a virtual epidemic

of electricity black and brown-outs around the world that have alerted policy makers to growing system frailty – and provoked voters to justifiable grumbling. These two grid energies are the ultimate just-in-time energy commodities, with electricity the least forgiving.

Policies and practices to deal with security threats to these systems will bear no resemblance to mechanisms in place for oil. Ultimately, gas and electricity markets will have to shoulder the responsibility for security and commercial systems. They will have to be robust enough that alternative service can be mobilised; contracting will have greater flexibility; communications between systems in contiguous countries will need to work better; and a minimum of incremental infrastructure will need to be put in place to permit wheeling of power or dispatch of alternative gas. All of that will require clear, constant signals from policymakers to regulators and regulators to the trade.

Fortunately, gas lends itself to storage and many sites are already in operation. Storage in the USA will respond to a price – Europe is not there yet. In Asia, storage possibilities are limited and expensive. Approaches are different for electricity, but the same principles of reinforced market mechanisms should guide the regulatory instructions to the power sector.

The Climate Change Challenge for the Longer-term

But all of these challenges appear almost prosaic when it comes to addressing the remaining major threat to energy security – our ability to manage the environmental consequences of our unfettered use of fossil fuels. Virtually no one is prepared to challenge the science demonstrating the impact of anthropogenic emissions of greenhouse gases (GHG) on the global climate. The 4th IPCC report heightened the degree of confidence in the causality of GHG on climate change and the urgency of responding.

No projection of energy balances into the future anticipates the replacement of fossil fuels in the next decades,

yet the environmental implications of growing emissions from that fossil fuel use are unacceptable. There are no silver bullets among the known options: efficiency, renewables, carbon capture and storage (CCS), nuclear, bio-fuels, and so on. Most projections assume a considerable impact of CCS in the medium term – it is probably the second most important factor in mitigating GHG emissions from fossil fuels – next to the un-harvested efficiency potential. Are the producers and consumers of fossil fuels around the world dedicating enough time and effort to proving up and displaying the potential for CCS or investing in the fifteen or so major demonstration projects required to identify the two or three winners? It does not appear so and this could place severe limitations on our ability to rely increasingly on those fuels.

We have seen a number of promising energy technologies that can play an increasingly important role in future energy balances. We cannot ignore any of them and need to test the potential of each. But few if any of these can really change the fundamental energy landscape of the next few decades. Fossil fuels dominate the mix. Emissions need to peak in less than ten years to get the world on a path to limit the increase in global temperatures to 2 degrees centigrade. It may be possible in OECD countries if they mobilise considerably more political will than has been shown heretofore. But it may not be possible globally as a large portion of the world's population aspires to a greater access to modern energy services. Coal generates 40 percent of all power and is set to increase. We need to direct more of the energies of the world's politicians, policymakers and people to addressing and changing the simple reality that the ample reserves of world oil, coal and gas are just not available if we can't burn them.



Hasan M. Qabazard outlines OPEC's abiding commitment to energy security

It is surprisingly difficult to define the word 'energy'. The *Concise Oxford Dictionary*, for example, provides four definitions. First: force, vigour; capacity for activity. Secondly: (in the plural) individual powers in use. Thirdly: (physics) the capacity of matter or radiation to do work. And fourthly: the means of doing work by utilising matter or radiation.

While I would not, for a moment, question the consummate skills of renowned lexicographers, I nevertheless feel that these concise definitions fail to capture the sheer enormity of the concept of 'energy' – its omnipresence in not just our world, the Earth, but also in the universe at large, as we understand it. Its grandeur. Its indispensability. Quite simply, without energy, there would be no life. There would be nothing. Anywhere, anytime.

Access to energy, so to speak, is access to life. This is as true for the universe at large as it is for the tiniest micro-organism that exists on our own planet today. Thus, when we talk about energy security, we are referring to something that is as basic as life itself. This is why OPEC attaches so much importance to the issue of energy security.

OPEC's very first resolution, dating from our inaugural meeting in Baghdad in September 1960, refers to 'the necessity of securing ... an efficient, economic and regular supply of (petroleum) to consuming nations'. This commitment has been reaffirmed repeatedly across many decades – in our declarations, resolutions, statements and decisions – right up to the present time.

Its latest expression will occur at the highest level in the middle of November, at the Third Summit of OPEC Heads of State in Riyadh, Saudi Arabia. The summit's three primary themes of 'providing petroleum',

'promoting prosperity' and 'protecting the planet', are all centred around this longstanding, unbroken commitment – 'supplying the world's petroleum needs', 'providing reliable supplies of petroleum' and 'providing reliable energy supplies', respectively. As with its two predecessors, in Algeria in 1975 and Venezuela in 2000, the Third OPEC Summit will conclude with a Solemn Declaration, and this is expected to reaffirm, once again, the principle of secure supply as being a central objective of our Organisation, maintaining the legacy that has stood firm for nearly half a century.

The new century has witnessed a heightened level of concern about energy security, and this has been particularly pronounced over the past few years. For example, we recall how, in spring 2004, after several years of relatively high stability, the oil market entered a period of volatility – suddenly and without any apparent warning – with protracted upward pressure on prices. This was caused by a combination of factors: unexpectedly large growth in world energy demand, especially in China and India; a relatively short-lived slowdown in the growth rate of non-OPEC supply; serious downstream bottlenecks in some major consuming countries; natural disasters and other unseasonal weather patterns; geopolitical developments; and enhanced levels of speculation, especially from non-commercials.

The situation soon escalated into a grander international debate on security of oil supply, with time-dimensions extending decades into the future – in the latter respect, this was because it was accommodating the increasingly articulated concerns of the peak-theorists, that world crude oil production could reach its maximum level in the next decade. Adding impetus to this was the environmental issue, with its potential ramifications for the oil industry, in the context of both climate change and local pollution.

All of this was happening, in spite of the fact that OPEC was, quite openly, taking measures to both increase output heavily and accelerate plans to bring on-stream new production

capacity, so as to re-establish a comfortable cushion of spare capacity in the market. OPEC was also reassuring the market that the world's oil resources were sufficient to meet the forecast heavy increases in demand for decades to come, through improved technology, successful exploration and enhanced recovery from existing fields – and this was even before one started talking about non-conventional oil. And, on top of this, the Organisation had become an ardent advocate of developing and deploying cleaner fossil fuel technologies, notably carbon capture and storage, with its large potential for reducing net greenhouse gas emissions, at relatively low cost.

At the same time, OPEC was continuing with its longstanding practice of scenario-building for the future world oil outlook, focusing on the next two decades, so that the market would be well-supplied with oil throughout this time-span and beyond. In other words, the Organisation attaches as much importance to ensuring security of supply in the future as in the present. This is especially important for an industry that requires high levels of upfront investment and which has long lead-times for its fruition.

If there is a year which could be described as a watershed for the energy security issue, it was 2006. This saw a broader understanding emerge in the world at large about energy security, as the issue rose high on the international agenda. Notably, it featured prominently in the European Union's Green Paper on a European Strategy for Sustainable, Competitive and Secure Energy, which was released in March; it provided the central theme of the Tenth International Energy Forum (IEF) in Doha in April – 'Energy security, a shared responsibility' – and it headed the agenda at the G8 Summit in St Petersburg in July.

Indeed, in the build-up to the St Petersburg summit, there was an International Conference on Energy Security in Moscow in March, followed immediately by a G8 Energy Ministerial Meeting. In its official statement to the Ministerial Meeting, OPEC made the point that 'the concept of "global energy security"

is so fundamental to life in the 21st century that every effort must be made to clarify its meaning, to gain a consensus on this and to ensure that its true principles are embodied in decision-making processes across the energy sector by at least the major players.' Other extracts from OPEC's statement, about the dimensions of global energy security, can be found in Box 1. These note, in particular, the reciprocal nature of energy security and the fact that it should cover all foreseeable time-horizons.

OPEC was heartened by the positive outcome of the St Petersburg summit in July 2006, on the issue of energy security. As the British Broadcasting Corporation said: 'The point of putting energy security top of the agenda was to require the Western world to examine the problem not just from their own viewpoint as energy consumers, but consider also the needs and concerns of those who produce the stuff and transport it.' Overall, the summit indicated a shift away from longstanding narrow, self-interested

views of energy security, with a strong emphasis on security of supply by consumers, to a greater appreciation of its broader, more universal nature, particularly with regard to the fact that security of supply and security of demand are mutually supportive and must go hand-in-hand.

Now, however, more than a year on, while recognising the advances made in St Petersburg, we wonder how much has really changed in practice. In February this year, for example, at the winter meeting of one of OPEC's neighbouring intergovernmental bodies in Vienna – the Organisation for Security and Cooperation in Europe – many gathered parliamentarians were clearly concerned about security of supply, and speakers called repeatedly for efforts to reduce energy consumption and, in particular, dependence on fossil fuels.

At the same time, there are still allegations from influential groups in some industrialised countries that OPEC is not pulling its weight in addressing the high prices and volatility that

Box 1: The Dimensions of Global Energy Security

It should be universal, applying to rich and poor nations alike. In particular, it should seek to honour the spirit of Johannesburg 2002, the UN World Summit on Sustainable Development.

It should be reciprocal. Security of demand is as important to producers as security of supply is to consumers.

It should apply to all energy sources in a manner that is free from prejudicial regulatory and legislative measures, such as the very high levels of taxation imposed on oil products in many consuming countries, in contrast with low taxation, no taxation or subsidies in other energy sectors.

It should apply to the entire supply chain. Downstream is as crucial as upstream as we have seen recently, and refinery bottlenecks can have a major impact on steady, secure supplies to the consumer.

It should cover all foreseeable time-horizons. Security tomorrow is as important as security today, and provision must be made for this at all times through sound investment strategies. In recent years, we have seen how concern over security of future supply can significantly impact today's prices.

It should focus on providing all consumers with the most modern energy products, meeting the highest environmental standards and benefiting from the application of the latest technology.

And it should be openly receptive to dialogue and cooperation among the leading players in the market, to facilitate the market's sound evolution in a balanced and equitable manner both now and in the future.

Extract from OPEC's official statement to G8 Energy Ministerial Meeting, Moscow, March 2006.

currently prevail in the oil market, in spite of all the positive actions our Organisation has been taking in this important and complex area over the past few years. Let me make it quite clear, therefore, that OPEC is prepared to respond at all times to any significant supply disruption, to ensure that the market remains with plenty of crude at all times. And it has a long and successful history of market-stabilisation measures, stretching back decades.

We are particularly concerned about the recent escalation in oil prices. Clearly, these do not reflect fundamentals. Indeed, at the present time, the market remains very well-supplied with crude. There has been no recent interruption in crude supplies, and OECD commercial inventories remain above five-year levels. Forward cover, which stands at 53.5 days, is also comfortable. The present rising oil prices are being driven largely by market speculators. Persistent refinery bottlenecks and seasonal maintenance work, ongoing geopolitical problems in the Middle East and fluctuations in the US dollar, also continue to play a role in pushing oil prices higher.

OPEC, whose Secretariat constantly monitors the market's activity, continues to seek a balance between supply and demand, as well as a fair price that is acceptable to both consumers and producers. As part of its mission to keep the market well-supplied, and, as agreed at its most recent Ministerial Conference in

September, the Organisation will raise output by 500,000 barrels a day from 1 November.

Our Member Countries are investing heavily in crude oil capacity, to ensure that markets are adequately supplied at all times and that there is a comfortable cushion of spare capacity. Going forward, capacity expansion plans already in place are expected to result in an increase of capacity by 2012 of over 5.0 million b/d, underpinned by more than 120 projects, and these are estimated today to correspond to more than US \$150 billion. In addition, many Member Countries are investing in the downstream, both inside and outside their borders.

Looking further into the future, our studies show that fossil fuels will continue to satisfy the lion's share of the world's energy needs for decades to come, and that oil will remain the leading source of energy, in particular in the transportation sector. Oil resources, as noted earlier, are plentiful. How to find, develop, produce, transport, refine and deliver oil to end-users in an efficient, timely, sustainable, economic, reliable and environmentally-sound manner remains a key objective. And OPEC is helping the industry meet this objective. This is demonstrated by the huge investment currently underway to add new production capacity, as and when it is needed in the years ahead.

However, here we find ourselves confronted by a major obstacle, in the shape of uncertainty over the amount

of oil that will be required in the future. Much of this uncertainty stems from consuming countries' policies, which are greatly hampering the decision-making processes of OPEC Member Countries, with regard to investment in further capacity. Such uncertainty can prove extremely costly for these producers. Our alternative lower- and higher-growth scenarios show, for example, that, even over the medium term to 2010, there is an estimated range of uncertainty of \$50 billion for required investment in the upstream, increasing to \$160 billion by 2015. This is why security of demand is such a key concern for producers.

In conclusion, I hope I have been able to impress upon readers the seriousness with which OPEC and its Member Countries take the issue of energy security, in all its forms. Energy security cannot be handled in isolation in a world subjected increasingly to the forces of globalisation. Energy interdependence should be the name of the game, where energy security is treated as a shared responsibility by all parties, and where security of demand goes hand-in-hand with security of supply.

OPEC, for its part, remains committed to ensuring secure, stable, reasonably priced supplies of crude oil to the international oil market at all times, in support of sound world economic growth and the general welfare of mankind, both now and in the future.

The Dynamics of Oil Price Determination

Paul Horsnell

Our main aim is to look at the key dynamic shown by oil prices in 2007. That is shown in the shape and position of the forward oil price curve, in both the move up in price levels and the return to backwardation at the front of the curve.

However, before tackling those issues head on, we believe we need to take a fairly large step back and consider the nature of price determination. In particular, it appears to us that many of the differences in views on oil prices come down to methodological, indeed almost philosophical, differences in ideas on what sort of an animal the market price actually represents.

There is a tendency for observers to anthropomorphise

the oil market. In looking through the language used in just a single day's press and analyst reports, we notice the common use of phrases saying that the market 'thinks', 'fears', 'senses', 'believes' and, remarkably, even 'loves'. However, the rest of the coverage and analysis of price determination tends to imply that the creature that is being thought of in that imagery is something that is more robotic than human. The market seems often to be treated as if it were, at its best, some higher intelligence and greater than the sum of its parts. Each price move is rationalised as if it were the result of some deterministic equation, the nature of which is observable only to the keepers of the flame. Prices are regularly sliced and

diced into their supposed constituent parts as if they were a layer cake, with concepts such as ‘geopolitical premium’ or, best of all, ‘speculative premium’ abounding.

The use of the premia concept is an example of the market being thought of as having a computational device at its core. It implies that there is some ‘correct’ price given by well-behaved and observable fundamental relationships. Geopolitical factors or the actions of traders add an additional slice which will usually be portrayed as being beyond fundamentals. Generally these rational and irrational parts of the analysis seem not to be allowed to interact, e.g. speculative activity is (incorrectly) not thought of as being driven in any part by fundamental factors. The premium can then become self-fulfilling as an analytical tool. After all, if you believe that prices should be lower, be that as the result of your own view of the determinants of prices or even just your instinct, but you see that prices are actually rising, then the concept of a premium can be very useful indeed. In other words, stating over a long period that there is a price premium due to some extraneous factor can represent an attractive alternative to simply being wrong.

There is also a certain dichotomy in approach implicit in this method. It often is put in such terms as to take the idea of a coldly rational wholly explainable fundamental basis for the ‘correct price’, and combine it with ideas of deeply irrational and supposedly wholly unexplainable dark forces represented by the influences of geopolitics and speculators. There is then a certain sleight of hand in that the approach is to see the market as if it were pure science, but then to analyse its actual behaviour as if it were pure superstition.

The view of prices as being the deterministic output of a calculating device might just be applicable in a market with close to perfect information, where the flow of data was rapid and reliable and where the underlying relationships between fundamentals and prices were well known and stable. Those conditions could just happen in some markets. However, the oil market does not fit that template, nor is it ever likely to. There is a fog in the flow of information which can never be totally cleared, and any previous belief in stable structural relationships that determine prices has been eroded away.

There is, however, an alternative view to that of the market as a sleek, perfectly calibrated measuring machine. That is in large part to see the market as being the sum of what Keynes called ‘animal spirits’, i.e. the urge to action rather than inaction. Under that view the market need not necessarily always be consistent. In effect, it could be said to possess many of the same neuroses and inconsistencies as those who trade in it. Most importantly, however, it will be a market in which the main task is to test out what the very opaque price determining relationships actually are, particularly at the back end of the forward curve.

We believe that the oil market behaves more like the latter construction than any calculating device. To anthropomorphise it, it behaves something like a toddler, constantly in search of defining where the boundaries of behaviour should be, and then constantly pushing towards those boundaries until it finds them and gets a reaction. Unless there is something acting *in loco parentis* that dictates what those boundaries are in advance, (normally OPEC), the market

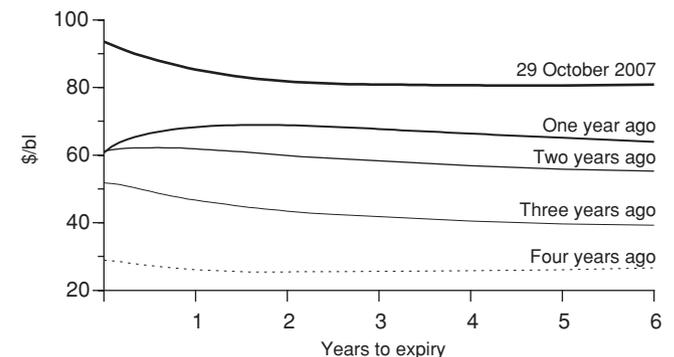
will tend to find them for itself. If you believe in the market as a robot, then you might rule out \$100 per barrel oil on the basis that it was too high for your individual perception of the state of the key price determinants. However, see the market as a toddler and you can be pretty sure that it will get to \$100 per barrel and above, as long as it encounters no immediate firm evidence along the way that suggests that that is the wrong price, and as long as no parent figure appears to be enforcing any alternative.

The difference between the two approaches is perhaps best seen in how one might judge whether a given \$10 rise in prices was justified. The robot theory would think of the starting point as being fairly well calibrated, so it would want to try to explain the \$10 in terms of new information, i.e. have things changed enough to justify the rise. More often than not in recent years, that approach has tended to state that price rises were not justified, and hence it has gone the route of ascribing them to the various invented premia.

However, the toddler theory does not rely on the idea that the price necessarily always starts from being anywhere near perfectly calibrated, that is, price changes do not have to be explained solely in terms of new information. If the market is going through a structural change in the belief of what the correct calibration actually is, then the process of discovery of the correct long-term price and price relationships can dominate the flow of new information over an extended period. In other words, under that view prices can rise for the very simple explanation that they started off too low for longer-term balance.

In our view the single most important explanation for price rises over the past four years has simply been that perceptions of the market clearing long-term price have been in the process of adjusting upwards, and they have done that simply because they were too low to begin with. That change in perception has come with the flow of evidence that the dynamics of supply and demand are rather different at higher prices than had previously been thought. That revelation has come about through having had higher prices, not because any single view or model convinced traders about what would happen at higher prices. In other words, the market, as toddler, revealed information that the market, as robot, could not, and indeed it was forced into that mode as soon as the previously long-held belief in a stable long-term price of \$20 melted away.

Figure 1: WTI forward price curve, \$/bl.



Source: NYMEX

The on-exchange forward curve for WTI is shown in Figure 1 as it stood at the end of October 2007 and, for comparison, at the same time in the previous four years. The rise at the back, i.e. in the proxy for the long-term price, has been fairly steady and remorseless, taking it from \$25 per barrel to \$80 per barrel over the period shown. Indeed, had one suggested four years ago that the back end would rise by a fairly steady \$14 per barrel per year, one would not yet have been significantly contradicted. Over those four years the geopolitical background has been altered, different fears about the economy have come and gone, and short-term oil market balances have swung across a wide range of outcomes; yet despite all those underlying sources of volatility the back end has kept up a fairly steady pace of increase. The long-term price has been in motion, and in the broader scheme of things it is the most powerful determinant of short-run prices. If you believed that the long-term price should be \$150 per barrel, then \$100 would not seem particularly remarkable whatever your view of the short-run dynamics; whereas if you believed in \$40 long-term, then \$100 in the short run is going to be harder to explain.

In terms of robots and toddlers, the robot view would look at the rise in the long-term price and try to rationalise each annual movement. One might be tempted into what could be seen as fairly desperate explanations. For instance, one could try to say that long-term prices should be determined by marginal costs, and that costs are rising by \$14 per barrel per year producing the observed rise in the curve. However, that sort of calibration does not seem particularly credible in our view. The link between costs and prices has tended to be very weak to non-existent in oil, particularly given the operation of the low cost producers at the margin of the market.

By contrast, the toddler view would be as follows. Rising demand due to non-OECD demand moving into the margin, combined with weak non-OPEC supply brought on by mounting decline rates in mature areas, has revealed that \$20 is too low a price to clear the market in the long run. As a result, prices are now testing upwards. That also carries the implication that, short of some obvious and discontinuous change in the relatively stable supply-demand dynamics of recent years, there is no guarantee that the upwards drift in long-term prices has stopped. Indeed, there probably has to be a presumption that it has not.

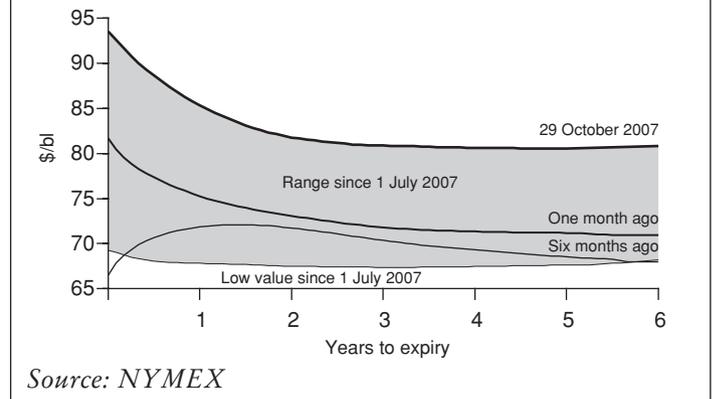
The above implies that the price curve has risen due to the lack of information flow suggesting that oil prices can not be higher, and the accumulation of evidence suggesting that they can not be lower. Under that scenario, the key role played by short-run information is what it says, or does not say, about the long-term position of the curve, and also what it implies about the required shape of the curve at the front.

In July, WTI moved into solid backwardation at the front of the curve (i.e. a premium paid for prompt over deferred delivery) for the first concerted period in over three years. Homing in within the space shown in Figure 1, the more recent behaviour of the curve is shown in Figure 2, where the key feature is the strong move to the steep backwardation of late October from the steep contango of late April. Indeed, comparing the curves shown on late September and

late April, the price for two years out hardly changed despite the \$15 rise at the front, while the entire curve has shifted up in a parallel fashion over the most recent month shown in Figure 2.

In our view, the long period of contango had been the direct result of producer policy that was fairly relaxed about allowing OECD inventories to rise in an attempt to help mitigate the pace of the trend increase in prices. A deliberate slight over-supply had been created at the margin, producing an incentive to hold and build inventory, and ultimately resulting in even the holding of significant offshore floating storage.

Figure 2: WTI forward price curve in 2007, \$/bl.



That policy changed with the demonstration at the end of last year and into January of how long it could take to control the downside to prices, and how large is the potential scale of that downside under conditions of high OECD inventories. The contango was finally killed nine months after OPEC first cut production and started the long process of a gradual tightening of the market. During that process, the oil held in discretionary floating storage has been absorbed back into the market, and the tightening at the margin has been enough to cope with that reincorporation of inventory, and yet still preserve the backwardation.

Our view is then that the general position of the curve is set by changing perceptions about what price is necessary to generate enough investment to balance the market in the longer term. The more that conventional non-OPEC supply is seen as having structural problems and the more that carbon-intensive solutions such as oil sands and coal-to-liquids are perceived as partial solutions, then the higher longer-term prices must rise. Likewise, the shape of the curve, particularly at the front of the curve, is set by shorter-term balances. In the 1990s the process was easier as there was a dominant view on the longer term that anchored the back of the curve, but with that view breaking down, price discovery at the back of the curve has become even more important than at the front. If one looks at the processes of position and shape of the curve as being distinct, the dynamics are easier to perceive. However, roll those separate processes together, and the confusion created is enough that deterministic views will tend to have to appeal to the default and unsatisfactory explanations of geopolitical and speculative factors.

Letter and Comment

Dear Sir,

Bassam Fattouh's piece on Sour Futures Contracts (*Oxford Energy Forum*, August 2007) draws attention to the disappointing early performances of the two new Sour Futures Contracts in New York and in Dubai. His analysis focuses on the technical designs of these two contracts, and he suggests that their respective architecture and delivery methodologies may have something to do with their disappointing inaugurations.

The author correctly points out that for any futures contract to achieve the traction needed for successful 'blast off', it must attract a critical mass of liquidity quickly, lest the self-fulfilling vicious circle of 'perceived illiquidity' take hold (a vicious circle which can only lead to contract demise).

In theory, the arrival of a sour crude futures contract should be welcome news, since hitherto, we have a tradition of two lighter, sweet contracts only; for choice, the market would surely prefer one liquid sweet contract, and one liquid sour. But the simultaneous launch of two competing sour contracts can only fragment the embryonic support and the interest. And without a concentration of support and interest, neither contract will achieve traction. This, (rather than delivery methodologies), is surely the Achilles Heel for the Sour Futures Contracts. But it is also worth asking ourselves whether we really do need a Sour Futures Contract of any kind in the first place.

Just because there is 'real demand' for a commodity, it does not follow that such a commodity automatically lends itself to listed futures trading. Real demand, real interest and real price risk are, indeed, necessary conditions for the success of a futures contract; but they only start to become *both* necessary and sufficient when there is no ready working alternative available. A1 Kerosene, (aka 'Jet') is a precedent example. Jet is obviously an extremely important hydrocarbon

commodity, with plenty of buyers and sellers trading around highly volatile price action. But the many attempts to establish futures markets for Jet have all failed. The liquid Over-the-Counter Market ('OTC'), meanwhile, continues to flourish as the preferred locus for Jet trading and price discovery. And perhaps we should expect the same of the Sour Crudes. The strength of OTC jet fuel markets (and of other middle distillate grades) borrows strongly from basis trading against the established liquidity pools resident at the world's two deep and liquid Gasoil-type futures markets. In the same way, then, the sour crudes may also continue to be priced and traded, not as a futures contract itself, but instead as an OTC spread against the enormous liquidity pools at the world's two successful sweet crude futures marketplaces. The fact that both of these successful marketplaces are increasingly financial in nature does not inhibit their continued growth, nor, therefore, their continued utility as a basis against which to price (and to OTC trade) other crudes of all stripe. And at the same time, the relative likelihood of this outcome has been assisted by the recent growth in OTC Clearing ... a valuable counterparty-credit solution, which had historically been available only through futures exchanges, but which is now increasingly applied directly into OTC theatres.

Yours truly,
Paul Newman
London



Robert Dudley comments on the Access to Oil Reserves Debate

The ability to access new reserves is key to the future of any commodity business. Today the oil and gas industry needs to deliver reliable supplies at an acceptable cost, and I would argue that at no other time during the industry's hundred-year history has the issue of access to new resources been so important to its long-term future.

The world is not about to run out of oil; ample resources exist and are available for development. To date we have discovered approximately 7 trillion barrels of conventional oil in place, of which the world has consumed about 1 trillion. Current estimates suggest that another 1 trillion barrels can be viewed as reserves.

But the challenge is accessing these resources, developing them in the most efficient manner and delivering them to the market. And their geographic location makes this difficult. The world's largest reserves are located in three countries: Saudi Arabia, Iran and Russia. Of these three, today only Russia offers international oil companies partial access to its resource base. This is important, because, with more than 380 billion barrels of oil equivalent (more than 100 billion boe of oil and more than 1500 tcf of gas in 'yet to find resources' (YTF), Russia today represents the largest exploration prize in the world. This compares with about 250 billion boe of YTF resources in Saudi Arabia, 110 billion boe in Iran and 80 billion boe in Iraq.

Operating Environment

Russia's operating environment is not easy for upstream companies. It is characterised by a very heavy tax burden which absorbs almost 90 percent of each incremental dollar when prices

are above \$25/barrel. Also, companies working in Russia have had to deal with high sector inflation and input costs that have grown significantly faster than the international average.

State involvement in the strategic oil and gas sector has increased significantly over the past few years; the sector is now dominated by state-owned champions, both in oil and gas. Nevertheless, this is not a picture of total nationalisation. Major private-sector players, such as TNK-BP and LUKOIL, continue to account for a significant share of the industry. Private sector companies still provide nearly three-quarters (73 percent) of Russian oil production.

Going forward, major state-owned players may grow larger, but they will continue to coexist in Russia with a number of large private companies.

Access for International Companies

As for international companies, barriers to entry into Russia's oil and gas sector are high. Russia is no longer interested in foreign investment just for the sake of cash. However, it will open to investment which brings additional value beyond just capital, such as international experience and market reach, world-class operating practices, technical and project management skills.

TNK-BP is an example. Four years ago, a 50:50 partnership was created by a group of Russian investors and an IOC to acquire some of the most depleted reserves in Russia. The Russian government supported the transaction. Since then, TNK-BP has

increased production by 30 percent, more than replaced this production with new proved reserves, and launched new clean fuels on the Russian market. The company has made significant refining upgrades and raised standards of corporate governance and transparency. Importantly, TNK-BP is training a new generation of world-class Russian specialists. During the past four years, it has paid more than \$50bn in taxes, duties and excises to the government which gave us licence to operate. And it is successfully working in equal partnerships with a number of state-owned companies. This is an example of the type of value that the government would seek from a foreign investor seeking to enter Russia's strategic oil and gas sector.

There are other examples as well. New opportunities are likely to emerge as the Russian industry moves to develop the Far East and Arctic offshore. These very large projects will be extremely capital intensive and technically complex. It is also likely that these projects will have a special status and the decision whether to allow international participation will be made on a case-by-case basis.

In fact, the need to share risks and deploy advanced technology make international participation probable – although most likely on minority terms. The Shtokman project is a case in point. While last year Gazprom said it would develop the project alone, relying on Russian and international contractors, this year the company offered stakes to France's Total and Norway's StatoilHydro, seeking to share risks and benefit from

their expertise in implementing this major Arctic offshore project.

Openness to Mutual Investment

Another recent trend is the increasing interest in foreign investment opportunities on behalf of Russian companies, both state-owned and private. Russia seeks access to investment in foreign assets as a way to hedge the commodity risks, and ensure greater integration in the global economic system.

Russia is more likely to open access to investment opportunities at home if it can get access to reciprocal investment opportunities abroad. In particular, Russian energy companies are interested in building integrated supply networks, getting closer to the end consumer and competing with other downstream companies. Equally, there is growing interest in foreign upstream projects. This is the underlying principle behind a number of deals that are currently under discussion.

In the current political climate, such deals often run into political resistance in the industrialised countries. Generally, however, this kind of cross-investment and interdependence are positive and should be encouraged. Openness to Russian investment abroad will facilitate greater economic integration, more reliable and efficient supply chains, and ultimately open access to investment opportunities for international companies in Russia.

Table 1: Shares of State-controlled and Private Oil Companies in Oil and Gas Production, 2003 and 2006

	<i>State-controlled companies</i>	<i>Private oil companies</i>
Oil		
2003	7.81 mb/day (92.7% of total)	0.61 mb/day (7.3% of total)
2006	7.05 mb/day (73.3% of total)	2.56 mb/day (26.7% of total)
Gas		
2003	547.2 bcm (88.2% of total)	73.2 bcm (11.8% of total)
2006	563.0 bcm (85.9% of total)	92.5 bcm (14.1% of total)

Environment and Climate Change

Simon Caney raises questions of ethics and justice

Few now dispute the gravity of the problems associated with climate change. The likely impacts – increased temperatures, rising sea-levels and unpredictable weather events – have been exhaustively chronicled by climate scientists worldwide. The most recent authoritative analysis is the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). In the ‘Technical Summary’ to the first volume of its 2007 report the IPCC projects that by the end of this century temperatures may rise by between 1.8°C and 4.0°C. It further projects that sea-levels may rise by between 18cm and 38cm (S. Solomon et al ‘Technical Summary’, p.70: available at http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_TS.pdf).

The economic issues at stake have been analysed in Nicholas Stern’s report on *The Economics of Climate Change*. The Stern Review found that taking no action would result in considerable economic costs and maintained that an aggressive policy of cutting emissions would not be unduly expensive. More precisely it argued that the cost of stabilising carbon dioxide at 550ppm was approximately 1 percent of global GDP. The scientific and economic aspects of climate change, thus, have received considerable attention. However, the ethical issues surrounding human-induced climate change have not received the same amount of attention.

The Ethical Dimension

This is somewhat surprising because anthropogenic climate change raises a host of ethical questions.

- The first is ‘what is wrong with climate change?’ Is it because of its impact on human happiness or

human rights? Or should we take a broader view and include the impact that climate change has on non-human animals and the natural world?

- A second, and related issue, also arises, namely, what should we count as ‘dangerous anthropogenic forcing’? The United Nations Framework Convention on Climate Change (UNFCCC) states that the parties to that agreement should avoid ‘dangerous anthropogenic forcing’ but what change would count as dangerous? This is, of course, in part a scientific question but it goes beyond that for it asks us to determine when the changes become a matter of moral concern.
- A third key question is: What obligations do current generations owe to future generations? The emission of greenhouse gases has effects not simply on those who are alive but also on future people. How should we think about this? One radical answer would be that we owe future generations nothing. Many, however, find this view unpalatable. A less radical view maintains that we should care less for future generations the further they are born into the future. To employ the terminology often employed, they argue that there should be a positive discount rate. Is this ethical?

The preceding three questions do not exhaust the ethical challenges that confront the current generations. Four further ethical issues remain.

- One concerns risk and uncertainty. Climate scientists stress that there is considerable lack of clarity about just how much temperatures will increase and sea-levels will rise. We do not possess certain knowledge of the impacts and costs of climate change. Given this, policymakers need to know how they should act in cases where there is a low probability of a catastrophic outcome (risk) and cases where the

probability of a dire outcome is unknown (uncertainty).

- In addition to this, policymakers also face the question of how to trade-off competing claims. Combating climate change will involve both cutting emissions and spending money on adaptation. Before policymakers commit themselves to such policies they must ask whether they have other obligations or commitments which should take priority.
- Once we have answers to this question we then need to ask: Who should bear the burdens of combating climate change? Should it be those that brought about the problem in the first place? This adopts the principle that the polluter should pay. Or should the burden be borne by those with the greatest ability to pay? Or should it be borne by those who have benefited from the activities that led to anthropogenic climate change? The UNFCCC asserts that the responsibility should be borne according to the doctrine of ‘common but differentiated responsibility’ (Article 3). This returns us to the preceding question because when determining who should pay for climate change one needs also to examine what other legitimate goals political actors might have.
- One further key question remains: namely, who should decide what policies to adopt? Who has the right to make decisions as to how much mitigation should occur and who should make which sacrifices? Similarly, who should decide the level of adaptation and how this is funded? Should all states be included in setting emissions targets? Or should this only comprise those who are required to cut their emissions? All the preceding questions are controversial. It is, therefore, crucial that they be arrived at through a fair political procedure and that those who have

a legitimate stake are included in climate negotiations.

Cost Benefit Analysis?

How should we think about these issues? The dominant approach is cost-benefit analysis. At first glance this seems an eminently reasonable way of addressing the above issues. Should one not compare the costs of combating climate change with the benefits of any such policy and act on this basis? This is the framework that is adopted by the leading economic analyses of climate change, including the Stern Review.

“What obligations do current generations owe to future generations?”

It is, however, problematic for a number of reasons. First, it represents an implausible way of thinking about risk and uncertainty. At its most basic, cost-benefit analysis aims to calculate the expected utility of a policy and it does this by multiplying the utility (or disutility) of an outcome by the probability that it will arise. If the probability is extremely low then even a major catastrophe will not result in a high expected disutility. The problem with this is that it overlooks the fact that *some* (those emitting high levels of greenhouse gases) are rendering *others* vulnerable to risks. Whether this is fair or not cannot be determined solely by whether the expected benefit to the risk-taker exceeds the expected cost to the potential victims. Whether some are entitled to expose others to risks requires more than this. In particular, we need to know the entitlements and rights of both the risk-takers and the potential victims and the other opportunities available to them.

Second, cost-benefit analysis provides a counter-intuitive way of reflecting about the costs of combating climate change. It maintains that when determining whether one actor should continue engaging in activity one must

include the cost to them of stopping and compare it with the resulting benefit to others. This, however, is not an appropriate model to use in cases where some are *harming* others. In cases of harm (such as, for example, assaulting others or damaging their property or enslaving them) we do not think that the cost of ceasing the harmful activity can entail that we should not cease the harmful activity. Rather we think that those engaging in the harmful activity (in this case emitting high levels of greenhouse gases) should desist.

Third, cost-benefit analyses are often indifferent to who bears the burden of combating climate change. They focus solely on bringing about an outcome in which benefits exceed costs. We care, however, about whether the costs are distributed fairly, and cost-benefit analysis cannot capture this concern.

Rights and Justice

These three objections are grounded in a common concern, namely that cost-benefit analysis fails to deal with people justly. This suggests that we need to consider what would be a just response to climate change. A plausible justice-based approach would, I believe, comprise the following components.

First, persons are entitled not to have their vital interests jeopardised by others. Anthropogenic climate change does, however, jeopardise a number of different vital interests, including an interest in having enough food to survive and an interest in health. The former is undermined by drought, freak weather events and flooding; and the latter will be jeopardised by the increase in heat stress and water-borne and vector-borne diseases. Persons are therefore entitled not to be exposed to climate change that undermines these basic interests. Adopting this approach we may then see ‘dangerous’ climate change as climate change that systematically and pervasively jeopardises these fundamental entitlements.

Second, however, we need to take into account the risks and uncertainties associated with climate change. Two key features are worth stressing

here. (a) Those most responsible for the problem are primarily the most advantaged in the world. It is true that China now emits more carbon dioxide than the USA but when we take into account the different population sizes, we see that the per capita emissions of contemporary Chinese people are much lower than that of Americans or Europeans. Furthermore, (b), the global poor are disproportionately vulnerable to climate change. Given these two facts it would be very unjust for the highest per capita emitters (who are also the wealthiest) to impose risks on others, such as the inhabitants of Bangladesh or small island states, (who are the most disadvantaged). The latter have a right not to be exposed to the risk of dangerous climate change.

“cost-benefit analyses are often indifferent to who bears the burden of combating climate change”

Third, we need to confront the inter-generational nature of climate change. What obligations are owed to future people? Some suggest that we should discount the entitlements of future generations merely because they are born in the future. This, however, is unjust for it treats some humans as inferior to others. It is a form of discrimination and it penalises people for morally arbitrary aspects about them. This is *not* to say that we may not spend more money on people who are currently alive but it is to say that pure time preference is unethical.

This leaves a fourth critical issue: Who should bear the burden of dealing with anthropogenic climate change? What is the fairest way of distributing the responsibility to mitigate and fund adaptation? One fundamental moral conviction is that the polluter should pay. It follows from this that those who have caused anthropogenic climate change should bear the responsibility to prevent dangerous climate change. This is the view famously articulated in Brazil’s

proposal to the UNFCCC in 1997. Although it is highly unlikely that this proposal will come into force, this does not undermine the force of the argument. To do that, someone will have to show why the deeply rooted idea that those who cause a problem are morally required to address it is misplaced. One qualification is nevertheless in order. The Polluter Pays Principle is indifferent to the standard of living of those emitting carbon dioxide. This, however, seems implausible. Some (the poor and vulnerable) need to emit carbon dioxide to cover their basic needs and it would be unjust to make them pay the full cost of their emissions if the effect of this is to leave them beneath a decent standard of living. The Polluter Pays Principle should thus be sensitive to people's rights to a minimum standard of living.

“Polluter Pays Principle should ... be sensitive to people's rights to a minimum standard of living”

Policies

What do these principles entail in practice? A number of different policy instruments –including carbon taxes, carbon trading, geo-engineering, the clean development mechanism, joint implementation, and regulations – have been proposed. The preceding principles of justice would, I believe, provide support for the following guidelines for a post-Kyoto policy framework.

1. Many argue that some scheme of carbon trading is essential if the concentration of carbon dioxide in the atmosphere is to stabilise at a safe level. A key advantage of such schemes is, of course, that by allowing high emitters to purchase carbon permits from others they provide flexibility. There are many different kinds of carbon trading schemes. Some advocate allocating

tradable permits to individuals; others think that permits should be allocated to states; and others suggest auctioning them to firms. Much could be said about each of these but the key point to observe here is that from the point of view of justice two conditions are paramount. First, the trading schemes must lower emissions and thereby secure the right not to be exposed to dangerous climate change.

Second, any trading scheme must distribute the burdens of lowering emissions fairly. The distribution of rights to emit greenhouse gases must be equitable.

2. It is widely recognised that, given the emissions of greenhouse gases in the past, some adaptation will be necessary. However, many of those who most need adaptation are neither responsible for the problem nor are they equipped to finance adaptation. Given this and given the above reflections on the Polluter Pays Principle, it follows that there needs to be a global adaptation fund that is financed by those who have caused dangerous climate change.
 3. If we are to prevent dangerous climate change and also enable developing countries to develop it is essential that the governments of industrialised countries incentivise the development and transfer of new clean technologies. Without such initiatives China and India's greenhouse gas emissions (and indeed those of the industrialised world) will inevitably continue to rise at an alarming rate.
- These proposals are, of course, not exhaustive but they do represent the start of an equitable response to the prospect of dangerous climate change.



Benito Müller presents a possible solution to the food miles controversy

The issue of the ecological impacts of food transport, particularly long-haul aviation, has been around for some time and has led to a drive by environmental organisations to promote the buying of local produce. A favourite example is fresh beans, particularly 'designer' ones such as mange-touts, air-freighted from places like Kenya.

It is argued that because they have to be transported by air, their carbon footprint (the carbon emitted in the course of growing and transporting the beans to the table of the consumer) is unacceptably high compared with local produce. This is, of course, not quite true. What is correct is that fresh beans in winter most likely have a higher carbon footprint than seasonal locally grown ones. What is not necessarily true, however, is that the carbon footprint of beans grown in Kenya is higher than that of out-of-season ones grown in the UK, even if air freight emissions are included. Indeed, there have been a number of studies which demonstrate that this need not be the case, and hence that for climate change purposes, the concept of 'food miles' is at best simplistic which can lead to unfair trade distortions.

Moreover, the export of fresh food and vegetables is one of the key ingredients with which some of the poorest countries in the world are trying to reap at least some high value-added benefits from global trade which otherwise passes them by. This must be kept in mind even if the total carbon footprint of their produce, as delivered in countries like the UK, were indeed higher than its local competition (grown in artificially heated and lighted greenhouses).

The Controversy

The Soil Association (SA), the UK's leading campaigning and certification

organisation for organic food and farming, which has been at the centre of the current controversy in the UK on the issue of food miles, has just come out with a press release explaining their position on certifying air freighted produce as 'organic' (www.soilassociation.org/airfreight). The press release begins with the SA decision that 'In future, air freighted organic food will have to meet the Soil Association's own Ethical Trade standards or the Fairtrade Foundation's standards, ... The Soil Association's goal is to minimise the use of air freight The new air freight standards will ... require our licensees to develop plans for reducing any remaining dependence on air freight.' While acknowledging that 'being able to export fresh organic fruit and vegetables provides significant economic, social and local environmental benefits, often for farmers with otherwise very low carbon footprints, [and that] For a small number of organic producers there are no available alternative markets offering the same development returns' the SA declared its intention to do 'all it can to encourage farmers in developing countries to create and build organic markets that do not depend on air freight'. For this reason the SA 'Standards Board will consider implementing carbon labelling within our standards for all organic goods – not just air freighted produce – when a good scheme is available. In the interim, we will be publishing information about air freight drawing on the material we have gathered during the consultation.'

With respect to internalising the carbon footprint, the UK Department for International Development (DfID), in turn, contends that 'the only fair option, which considers the livelihoods of those in developing countries as well as the need to protect the environment, is to ensure that the prices of the goods we consume cover the costs of their environmental impact, wherever they are from and however they are produced.'

It is certainly true that this approach is fairer than singling out air-freighted agricultural produce as intrinsically

bad, but it is by no means the only fair option, or indeed the fairest one. As has been pointed out by a number of commentators, such as James MacGregor, it can be cogently argued that produce of countries like Kenya, with per capita emissions of 0.1tC (155th in world-wide ranking, and 50 times less than the UK) should not be discriminated against on carbon intensity grounds, because they are within the boundaries of their 'ecological space,' i.e. the emissions that they should be allowed to emit for sustainable development.

The Facts

Food-miles are an over-simplified indicator of harming the global climate. A number of studies analysing the total carbon footprint of agrarian products, particularly those sold in the UK, have conclusively shown that the full life-cycle climate change impact of food supply in industrialised countries cannot be reduced to simple distances between consumers and producers. According to DfID, research has shown that 'the emissions produced by growing flowers in Kenya and flying them to the UK can be less than a fifth of those grown in heated and lighted greenhouses in Holland.' In other words, 'food miles' – the distance between grower/producer and consumer – are woefully inadequate as a measure of the climate change impacts of agricultural produce, indeed of any product! What is required instead is indeed a full *life-cycle carbon footprint analysis*, as ultimately envisaged by the SA.

The emissions due to importing fresh produce from the poorest and most vulnerable countries are manageable. The transport carbon dioxide emissions associated with fresh fruit and vegetable imports to the UK from Sub-Saharan Africa (excl. South Africa) have been estimated to be between 279,000 and 686,000 tCO₂, which at current prices would cost between £2.8m and £6.7m to offset through, say, the acquisition of credits (Certified Emission Reduction or CER) generated.

The harm to the poorest and most vulnerable countries through boycotting

their fresh agricultural produce is significant. 'While the climate change debate identifies air-freighted fresh produce from sub-Saharan Africa as the epitome of unsustainable consumption, research shows over one million livelihoods are supported in part owing to the fresh produce trade with the UK alone' (*Fresh Perspectives*, September 2007). According to the Kenyan High Commission in London, the Kenyan horticultural industry supports around 135,000 Kenyans directly and many hundreds of thousands more indirectly, and the produce supplied to the UK alone generates at least £100m per year for Kenya. In other words, the benefits of trading these high value-added goods for these countries are significant.

A Possible Solution

There is a way in which both the environmental and the developmental concerns involved in the food-miles controversy can be resolved equitably – taking into account the 'ecological space' argument – without trying to deprive the poorest producers in the world to partake in the benefits of global trade.

Equitable offsetting. Use public finance to offset the international transport emissions generated for fresh fruit and vegetables imported from the poorest and most vulnerable countries, say through the acquisition and retirement of credits generated under the Kyoto Protocol Clean Development Mechanism, preferably in the producing countries, indeed in the producing sectors in question, thus providing not only a double sustainable development dividend, but also providing much needed pilot CDM projects in these countries. Unfortunately, the CDM has thus far largely passed by these countries in favour of the large developing country emitters like Brazil, China and India; and most of the poorest countries have not even had a single demonstration project on the ground.

Fair labelling. Use proper carbon labelling – such as that currently developed by the UK Carbon Trust – ensuring that the carbon offsets are taken into account, as well as

emphasising the development benefits of these produce, be it indirectly as in the 'grown under the sun' labels proposed by the Kenyan High Commission or directly through some sort of fair trade label.

Support of shift towards less carbon intensive transport. In addition to offsetting the offending international transport emissions the consumer countries should also help the producers (1) by improving maritime technology to make it amenable for shipping their products, as well as (2) to help them grow produce of equal social benefit which can be transported by sea.

Using these measures will ensure that the poorest producers will continue to be able to reap the benefits of global trade in a fair and sustainable manner.

This article is based on an OIES Energy and Environment Comment at www.oxfordenergy.org



Robert Ritz discusses the relative merits of emissions taxes or trading?

Introduction and Recent Policy Experience

Climate change has taken centre-stage on the agenda of business, politics and economics. The Stern Report on the Economics of Climate Change recently concluded that the benefits of addressing climate change are likely to far outweigh the associated costs and a strong consensus has emerged that 'something needs to be done'.

However, there is still considerable disagreement about what the most

appropriate policies to tackle climate change are. The problem has two key features. First, there is substantial (scientific) uncertainty surrounding the causes and, especially, the effects of climate change, complicating the policy analysis. Second, a clean environment is a 'global public good' in which all have a stake, and amongst all of whom solutions need to be coordinated.

From an economic viewpoint, the policy objective is to achieve emissions abatement at least cost. Two market-based instruments in particular have been at the forefront of the debate: emissions taxes and emissions trading. The idea behind both of these instruments is to make polluters internalise the negative environmental externality they impose on others by making pollution costly.

An emissions tax (often also referred to as a 'carbon tax') directly puts a price on each unit of emissions (say, per ton of CO₂), but leaves polluters free to emit as much as they see fit. By contrast, an emissions trading scheme (also known as a 'cap-and-trade' scheme) fixes the overall amount of emissions by creating a fixed supply of emissions permits, which participating firms can trade amongst each other, or with outside parties.

Both instruments have been used in recent climate policy. The European Union's emissions trading scheme (EU ETS) – which has been in operation since January 2005 and covers approximately 50 percent of European carbon emissions – is probably the most well-known example of a cap-and-trade scheme. In Sweden, a carbon tax related to emissions from domestic travel was introduced as far back as 1991.

Market-based Instruments or Command-and-control?

Before discussing the relative merits of emissions taxes and trading, one might ask when, and why, market-based instruments are better than other forms of regulation. Indeed, 'command-and-control' regulatory policies such as standards and outright bans continue to be widely employed in some parts

of the economy, arguably not without success (consider, for example, food or safety standards).

In practice, there are two inter-related problems with such forms of regulation. First, a policymaker in general does not have perfect – indeed typically only highly incomplete – information on the actual costs (borne by firms) and benefits of emissions reduction and therefore must, in effect, resort to a 'one-size-fits-all' policy. Second, polluting firms are very likely to be asymmetric in that they do not all have exactly identical costs of abatement, so a one-size-fits-all policy will inevitably be economically inefficient.

Consider a stylised example. Suppose that there are two firms that each emits two units of pollution. Firm 1 can cut its emissions at very low cost, whereas Firm 2 has much higher costs. Suppose further that the regulator imposes a policy that *each* firm must cut its emissions by one unit.

This creates a substantial imbalance in the unit ('marginal') cost of emissions abatement, which is economically inefficient. In this example, it would be much better for Firm 1 to cut its emissions by two units and then sell its 'surplus' reduction to Firm 2, say in the form of an unneeded emissions allowance in a trading scheme. The overall cost of achieving the regulator's two-unit emissions reduction then is substantially lower.

Hence, as applied to large-scale climate policy, there is a strong presumption that market-based instruments – that make use of the price mechanism – are preferred, at least for the time being.

Relative Merits of Emissions Taxes and Trading

The basic economic cost-benefit analysis of emissions taxes and trading determines which instrument can be expected to lead to higher welfare. Thereby, emissions taxes are seen as a price instrument, while quota-based emissions trading is regarded as a quantity instrument.

In a hypothetical world in which a

policymaker has perfect information on the costs and benefits of emissions abatement, price and quantity instruments are easily seen to be equivalent. Indeed, the price (emissions tax) set would directly imply a certain single quantity (level of emissions) that perfectly internalises the social cost of carbon, and vice versa. Because of this equivalence, neither an emissions tax nor emissions trading is intrinsically preferable to the other in a world of perfect information.

However, as already noted above, in practice there is considerable uncertainty surrounding costs and benefits and policymakers' information is highly imperfect. In this setting, an emissions tax is more efficient than an emissions quota if the marginal cost of emissions reductions is steeper than the marginal benefit curve. Put differently, if a unit reduction in emissions becomes increasingly costly relative to the benefits it yields, then a tax is preferable to a trading scheme. Conversely, if a unit reduction in emissions yields fairly stable benefits relative to costs, then an emissions trading scheme is preferable to an emissions tax.

The current consensus appears to be that this analysis favours taxes over trading. The logic is that emissions abatement is already becoming increasingly more costly for firms at the margin (for example, as they have to switch to new production technologies), whilst the state of the environment really depends on the *stock* of past emissions, so the marginal benefit curve is rather flat.

However, the reverse argument can also be made. If there are still many 'low-hanging fruit' (unused, low-cost opportunities), such that the unit cost of abatement does not rise too quickly, and the climate is indeed close to a 'tipping point' (implying rapidly increasing marginal benefits), then an emissions trading scheme is the better policy.

Further refinement can also be achieved by 'hybrid' policies that combine particular features of both taxes and trading. For example, an emissions trading scheme can have a ceiling (say, by way of a 'buy-out'

price) and/or a floor on the (otherwise market-determined) permit price.

Moreover, as policymakers learn and gain experience over time, and uncertainty over costs and benefits decreases, making appropriate adjustments to an existing scheme (either taxes or trading) will tend to make the two instruments more similar in their (potential) effects.

As the underlying science means that limiting emissions is the main long-run concern, these points taken together may suggest a carbon tax (and hence a stable price signal) in the short run, and an emissions quota for the long run.

Revenue Usage and Distributional Issues

The benchmark analysis above abstracts from a number of political-economy considerations that can play important roles in practice. Indeed, both emissions taxes and trading in principle are sources of government revenue and can have substantial distributional consequences.

While the 'current' EU ETS (Phases I and II, 2005–2012), in which almost all emissions permits are given to the participating firms for free, is not (yet) a significant source of government revenue, any emissions trading scheme with a sizeable proportion of allowances sold to firms at auction is. However, the allowance allocation methodology underpinning a cap-and-trade scheme at the same time offers an important policy lever to help ensure 'buy-in' from firms.

Most recent research suggests that even a profit-neutral emissions trading scheme (that preserves industry-level profits) would typically involve auctioning of around 50–70 percent of emissions allowances. The levels of free allocation in the current EU ETS thus appear too high, also given the other efficiency gains associated with auctioning. An emissions tax obviously raises tax revenue and (loosely speaking) corresponds to a 100 percent-auctioned trading scheme in this respect.

A standard argument is that such

government policies should be 'revenue-neutral'. There are two leading – but not mutually exclusive – options. First, other taxes (such as income taxes, perhaps especially for lower incomes) could be decreased in tandem. Second, some of the revenue could be directed towards supporting investment and R&D in low-carbon technologies.

Emissions trading schemes also have the potential advantage that they can naturally be 'linked' internationally to other policy initiatives such as Kyoto's Clean Development Mechanism (CDM).

Conclusions and Policy Implications

Climate policy is becoming increasingly important to business, politics and economics and market-based instruments are likely to continue to play a central role. Economic theory yields a sharp characterisation of the circumstances under which emissions taxes are preferred to trading schemes (and vice versa).

However, the relevant parameters are extremely hard to pinpoint as a practical matter and the debate is likely to remain ongoing for some time in this regard. Several political-economy considerations appear to point towards an emissions trading scheme, in particular those related to distributional issues.

The existing emissions taxes and trading schemes are steps in the right direction, but far from perfect. There is still too little international coordination between schemes and probably too little thought is being given to the question of revenue generation and usage, especially in the current EU ETS.

Future climate policy thereby needs to acquire credibility in the eyes of firms (and citizens) much along the lines of other government policies.



Paul Newman assesses the development of the EU emissions market place

The Carbon Market has recently emerged in Europe, and *it* is developing all the time. Two and a half years ago, my company ICAP was arranging the odd 'grey market' deal once a fortnight or so, and we had one research graduate looking at the sector. Now, we employ five full-time specialists and arrange seventy or so deals a day, with total daily volumes of one and a half to two million tonnes. What does two million tonnes mean? To give these numbers a bit of context, there has been a recent estimate for how much CO₂ we would save in the UK if we switched over all of the 130 million incandescent light bulbs sold every year to those nasty looking energy saving ones. And that estimate is 1.9 million tonnes a year, which is pretty much the same volume that we arrange at ICAP on an average day.

I have already made the mistake of calling the Carbon Market an '*it*'. It is not an '*it*'. In the first place, let us remember that the trade is not in carbon ... but in non-carbon. What a certificate certifies is that a tonne of CO₂ has *not* been emitted by the seller, and can therefore be emitted by someone else, that is by the buyer. In fact, *The Economist* suggested some time ago that the more appropriate name is the 'Not-Carbon Market'. And again, I have dropped into using '*it*' as if this was one market, one thing, one locus of price transparency. Of course this is not the case.

Even at the most basic level, there are three distinct activities. First, the EU trading scheme and its EU Allowances, secondly, the Clean Development Mechanism with its Certified Emission Reduction Units (CERs), thirdly, the Voluntary Sector, what I would call here the 'Have a Go and Feel Good' stuff. And this third area should always be approached

with flashing Latin lights saying 'Caveat Emptor', or 'buyer be VERY wary'.

There are clear overlaps between these three activities, but of course the largest, most coherent one is the EU Trading Scheme. It is thought to be worth some Euro 25 billion a year now, and we have well-developed markets up and running in both listed futures and bilateral over-the-counter trade (OTC).

The second set, the Kyoto Protocol 'Clean Development Mechanism' has its own instrument in the CER which carries the imprimatur of the United Nations, and which in certain limited ways can be traded into the liquidity pool of the EU Trading System. I mentioned 'overlap' above, and I think it is worth pointing out that this overlap is not just of the market mechanism type; it is real political, collaborative overlap between some of the great pieces of today's supranational furniture. Incidentally, over half the approved CERs so far have been in China. There is in that a third pretty large toy in collaborative play as well. Finally, this March, Gazprom, Merrill Lynch, Dresdner Bank and others were reported to be getting together to look at Russian CERs.

My purpose here is not to concentrate specifically on the great political issues of our time, but I hope I am building up a picture showing that the early years of the market for emissions has become something of an engine to coalesce some – perhaps unlikely – bedfellows under a common purpose. On 31 May, President Bush announced his administration's determination to downplay the traded market mechanism, United Nations and Kyoto-inspired initiatives, and pan-continental collaborations of all stripe if they were 'under' multilateral leadership. That day, a journalist asked me for my reaction to the speech, and I did not hesitate to say that at this point, the correct way to look at President Bush's position is to ask, 'so what?' The market as it is now has moved from No where to Some where very quickly, and will carry on developing and maturing with or without support from the Bush

administration. The EU has committed to reduce its emissions by 20 per cent from 1990 levels by 2020, and this is a simple, highly visible target which will be delivered whatever the rest of the world does.

One of the surprises in the Bush speech on 31 May was his rejection of the Cap and Trade market mechanism as the right way forward. And some indeed ask the ambiguous question, 'Is Cap and Trade the right way?' By 'the right way' what we have to mean, surely, is the right way of moving towards lower emissions.

“What a certificate certifies is that a tonne of CO₂ has *not* been emitted by the seller, and can therefore be emitted by someone else, that is by the buyer”

Among the alternatives to 'Doing Nothing', taxes are often suggested as a way forward. But actually, if we get the mechanisms right, and we can put together a proper well-organised Cap and Trade marketplace, we should be moving on the right track. This is because one of the nice things about a market-trading approach is that it ensures that the emissions reductions take place where the cost of the reduction is lowest; and that, in turn, means that we are therefore lowering the overall costs of combating climate change.

At this point it may be worthwhile to give Defra (the UK Department of the Environment, Food and Rural Affairs) due credit for being visionary and pro-active in their support for this market. The Defra website unequivocally makes the point that 'by allowing participants the flexibility to trade allowances, the overall emissions reductions are achieved in the most cost-effective way possible' (www.defra.gov.uk). And when it comes to taking the job seriously, and applying for fair and reasonable national allocations, for instance, Defra have also led the way for others as an example

of membership-integrity and professionalism.

When we compare a trading scheme with a tax-based approach, we find an interesting technical reason why it makes more sense for the EU decision makers to prefer a trading programme over taxes. Within EU policymaking, taxes require unanimity. An emissions trading programme, on the other hand, counts as ‘environmental’ which leaves it in the territory of Qualified Majority Voting. And it is a lot easier to get something as complex and tricky as this through if there is no requirement for unanimity, and no opportunity for single country veto.

There has been a good deal of comment – and a good deal of pain – following Phase 1 of the programme, and its shortcomings. Most of us remember the price action last May when Phase 1 EU certificates lost half their value in a matter of days, and went on to lose the other half over the next months. But let us not forget the scale of the ambition here. Three years ago, this market was a pipe dream; and not just the actual market itself. In less than three years, the whole subject of emissions control has come from more or less nowhere to the centre of contemporary discussion. PointCarbon tells us that their recent Copenhagen conference was 500 per cent up on attendance compared with previous years. So yes, this has come a long way in a short period of time, and for all the loss of confidence over the price collapse, we have to see Phase 1 as just a first shot; a first shot at what it would be like to force companies to find their own lowest cost of abatement by internally decreasing their emissions, and then selling unused permits into the market.

The penalties imposed for failure (40 Euros per tonne in Phase 1 compared to 100 Euros in Phase 2 starting next January) also show that Phase 1 was always intended as somehow a test-bed. And I would argue that as a Beta run it was not so bad. Remember, that although the price collapse did leave a bad taste, in fact the Allocation Plan organisers were only out by about 2 percent for an entire plan of

6.3 billion tonnes of CO₂ allowances. Putting things in context, it would appear that 2 per cent either side is hardly the mad gaffe that is often claimed. Furthermore, this claim is most often heard from corners of the room where long positions were held as the price moved from 6 Euros to 31 Euros in its first fifteen months of trading; and from corners of the room where traders felt they had not had a good enough chance to run for the door when the meltdown came.

“one key ingredient we do always need for an ordered marketplace is clear and well recorded information about what is actually happening on the day-to-day trade flow”

So what are the lessons for Phase 2, and indeed for other trading schemes elsewhere? The first lesson has to be a more disciplined and refined analysis of allocation needs; and the National Allocation Planning for Phase 2 seems to show that we now have that. But this can never be an exact science. It can not simply because, by definition, every time oil prices, or gas prices, or coal prices make a major move of any kind, there are new decisions to be made about how many certificates a firm may or may not now need, while it fine-tunes and adjusts its energy mix. That’s the market, that’s how it works. So while the Phase 1 price collapse last May was what we can call ‘Chaos’ rather than ‘Order’, we should always remember that continued price stability is *not* a necessary condition for an ordered marketplace.

However, one key ingredient we do always need for an ordered marketplace is clear and well recorded information about what is actually happening on the day-to-day trade flow. Let me mention that the trade body London Energy Brokers Association (LEBA) has done a good job of collating the daily flows in the bilateral over-the-counter (OTC)

market; otherwise these OTC flows would remain private and invisible. The collating works as follows: the mainline wholesale brokers submit all their activity into a central pot on a daily basis, and a Daily LEBA Index is computed and published on the LEBA website. In fact, this methodology is actually fairly sophisticated, because it volume-weights the different size of each trade that is reported. The resulting index really is a fair representation of the underlying activity.

Another reason for having sympathy for the EU organisers is that if Phase 1 involved 6.3bn tonnes, and if it only took 2 per cent surplus to cause such immediate price meltdown, then they certainly have their work cut out in Phase 2. While Phase 1 applied to only about half the total CO₂ emission activities, and only five dirty industries, the next Phase will include pretty much all the gases, all the industries and all the locations where they occur. So the increased complexity of Phase 2 presents a new challenge in how to accurately calibrate the allocation plans.

For me, the biggest question here is whether that calibration procedure really can happen with sufficient accuracy to allow for a continually ordered marketplace all the way out to 2012. I, for one, certainly hope that it can, because if it can not, this new and imaginative marketplace will finish up as a side note in the history book of human beings trying to do something intelligent together and failing.



Liz Bossley describes the background to Bali

As the world's climate leaders prepare for their last meeting before the Kyoto Protocol takes effect on 1 January 2008, the focus of attention will be on China, India and South Korea, three rapidly growing countries who have signed the Protocol, but who have not agreed to cap their emissions. These countries could have a much larger impact on the international price of carbon if they continued to reject Kyoto emissions caps and instead devised their own domestic greenhouse gas trading schemes better suited to their own needs and under their own control.

Background

The 13th Conference of Parties (COP 13) to the UN Framework Convention on Climate Change (UNFCCC) takes place in Bali between 3 and 14 December 2007, coinciding with the 3rd Meeting of Parties (MOP 3) to the Kyoto Protocol.

The Kyoto Protocol comes into full force and effect on 1 January 2008. Thirty-eight developed (UNFCCC Annex 1/Kyoto Annex B) countries have been given legally binding targets to reduce their emissions of greenhouse gases (GHGs) by on average 5.2 percent compared with 1990 levels in its first commitment period of 2008–2012. This average target was spread unevenly amongst the countries concerned as the result of a highly charged political negotiation:

EU	-8% average
USA	-7%
Croatia	-5%
Japan/Canada	-6%
New Zealand/Russia/Ukraine	0%
Norway	+1%
Australia	+8%
Iceland	+10%

Australia and the USA refused to ratify the protocol largely, but not solely, because the world's fastest developing economies, the so-called non-Annex 1 countries, were not

obliged to commit themselves to cap their own emissions growth.

In Bali discussions on the second Kyoto commitment period will centre on which countries will accept caps and what those caps will be for 2013 and beyond. It is now almost a foregone conclusion that Australia will ratify Kyoto after its elections on 24 November because both the main opposition parties have said that they will do so. It is also just a matter of time before the USA comes in to the Kyoto fold as the tide of US public opinion in favour of ratification is likely to prove too strong for the ultimate successor to George W. Bush to resist.

Pressure on China, India and South Korea to accept a cap from 2013 is growing but so far only South Korea is showing signs of weakening. It is this author's opinion that these three countries should stand firm and resist the imposition of Kyoto caps. This is because any caps that they might be induced to accept are likely to be set high for political reasons so as to undermine the whole Kyoto cap-and-trade concept.

The Cap and Trade Concept

The general idea of cap and trade is that a central authority, in this case the UN, sets a limit on permitted emissions levels. The central authority allocates a number of allowances, i.e. rights to emit, below current

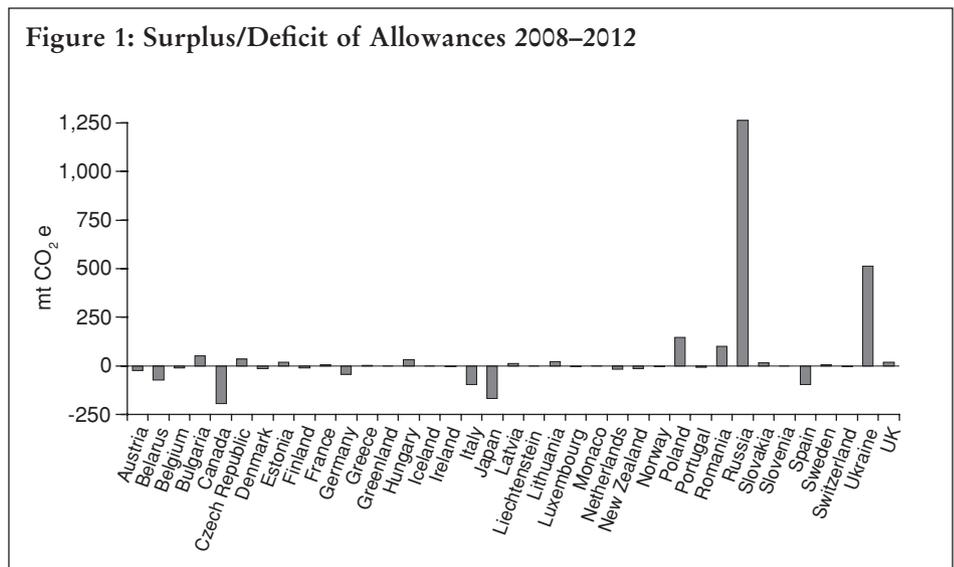
emissions levels, creating a shortage of allowances. The emitters must obtain sufficient allowances to cover their actual emissions levels over the target period, in this case 2008–2012. The emitter, faced with an allowance shortage, can then either cut its production or, invest in cleaner technology that emits less carbon per unit of production or, it can buy in the market sufficient allowances to cover its shortfall.

For Kyoto to achieve anything there must be a shortage of allowances such that their traded price is high enough to incentivise change. A positive allowance price will encourage countries and companies who can cut their emissions cheaply to do so, in order to generate a surplus of allowances to sell to those for whom emissions cuts are less easy and more expensive.

Kyoto looks to have fallen at the first fence in this objective. The surplus of allowances in the hands of Russia and the Ukraine during the period 2008–2012 is vastly greater than the shortages of all the other capped countries put together (see Figure 1). This is because of the choice of 1990 as the base year against which emissions caps were set: in 1990 the USSR's economy was much larger than that of the countries that emerged when it broke up.

This suggests that the price of carbon may be so low in the period 2008–2012 that there will be no

Figure 1: Surplus/Deficit of Allowances 2008–2012



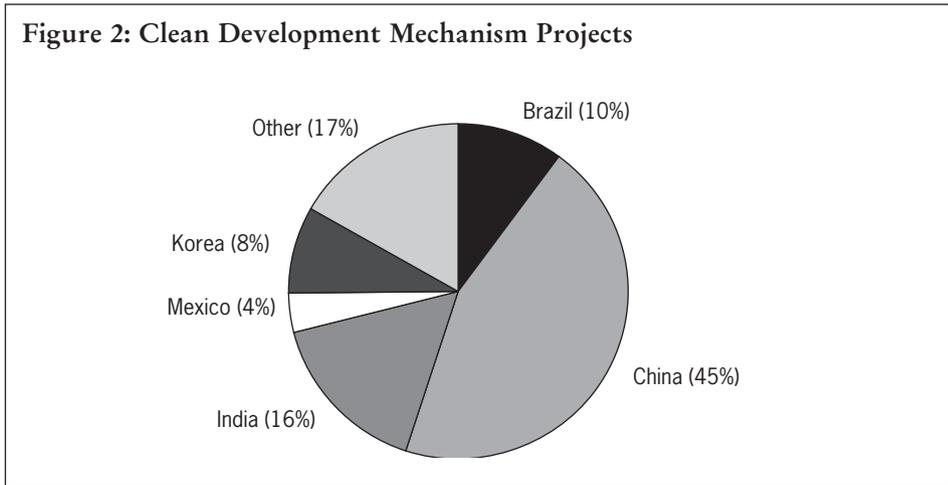
incentive to cut emissions. However, the situation may be retrieved by the fact that Russia can choose to carry forward some of its surplus into 2013 and beyond when caps should be set lower. Furthermore the countries that are short, notably Canada and Japan, have said that they will not buy 'hot air' from Russia i.e. surplus allowances that have been generated without any effort to cut emissions levels. Nevertheless the existence of the Russian surplus should put a psychological ceiling on prices in the first period.

It would be unfortunate if the cooperation of the Non-Annex 1 countries such as China from 2013 were to be bought with a cap that is so high as to create a similar surplus in the second commitment period. It seems highly unlikely that China would accept a real limit on its rapidly growing economy and all of its rhetoric suggests that it will not do so. A high cap for China would not only fail to limit Chinese emissions, but could also create an emissions allowance price that is so low as to undermine efforts to cut emissions in the Annex 1 countries.

The Contribution of the Non-Annex 1 Countries

The fact that the Non-Annex 1 countries have not agreed to emissions caps does not mean that they are not contributing to the effort to mitigate climate change. Through the Kyoto Clean Development Mechanism (CDM) these countries are hosting clean technology projects financed by foreign investors who are rewarded in the form of tradable allowances, called Certified Emissions Reductions (CERs) (see Figure 2). These CERs can be sold on the international market or be used by Annex 1 countries to meet their own country-wide emissions caps set by the Kyoto Protocol.

The more CDM projects that are hosted by the Non-Annex 1 countries, the cleaner will be the technology underlying their inevitable economic growth. However the downside of this approach is that the more CDM projects that exist, the greater the



number of CER allowances that are created to add to the surplus already bearing down on the market price.

To guarantee a high emissions allowance price that incentivises green behaviour worldwide, there has to be a change in the fundamental supply and demand parameters of the Kyoto emissions trading scheme. This is where the Non-Annex 1 countries, particularly China, could achieve most from its position outside the Kyoto cap-and-trade mechanism.

If China were to devise its own domestic cap-and-trade mechanism, targeting whichever sectors, industries or regions within its own borders that it deemed appropriate, it could buy a significant proportion of the international market surplus of allowances for compliance with its own domestic scheme. This would rescue the price of allowances in the international market and support the objectives of the Kyoto Protocol without the need for negotiating a Kyoto-prescribed cap.

In this way China, or any other Non-Annex 1 country or even a country completely outside Kyoto for that matter, could encourage green growth in its own economy. If the international carbon price is low, this would be achieved at minimal cost. If, against all expectations, the international carbon price turns out to be high, the Non-Annex 1 country could adjust its domestic cap levels without consulting the UN if the compliance burden proved too onerous for its growing economy.

Mechanics

Any country, region, local authority, company or individual can trade in most of the different types of Kyoto allowance asset classes by opening up a registry 'Person Holding Account' in one of the 25 operating European allowance registries. This is achieved by a process similar to opening a bank account.

In time, as the various US regional schemes, such as the Californian or the RGGI scheme, the New Zealand and Australian emissions trading schemes start trading, a country such as China can recognise emissions allowances from around the world, not just those generated by Kyoto. It could, if it chose to do so, also recognise allowances from good quality voluntary emission reduction schemes (VERs).

At the moment, Kyoto-generated allowances are not fungible with allowances from other sources such as US, Australian and VERs. In other words a US allowance cannot be used by an Annex 1 country to meet its Kyoto cap, or vice versa.

If sufficient Non-Annex 1 countries chose to introduce domestic emissions trading schemes outside the direct control of the UN, but using existing Kyoto-based allowances and/or allowances generated by non-Kyoto schemes, it would not only raise the international carbon price but also provide a fungibility link between the prices of allowances from diverse sources that are not otherwise interchangeable.

Asinus Muses

The fault of the fat?

We have entered a new epoch of scapegoating: suddenly it is not the carbon producers who are being blamed for everything but those referred to by governments and doctors as ‘the obese’, a word intentionally confusable with ‘obscene’ but actually meaning rotund, stout, portly or Falstaffian. Such people are accused of, among many things, bankrupting health services and the especially anti-Falstaffian British government says they have to be stamped out – well, thinned down – and has accused them of creating a ‘potential crisis on the scale of climate change’.

Do-it-yourself carbon capture

Asinus’s opinion is that, far from creating an additional crisis, human rotundity could be the answer to climate change. What is fat, after all, but the most natural form of carbon capture? For a given population, the greater the proportion of fat people the lower is the amount of greenhouse gas which accumulates in the atmosphere. Just as fat people have saved humanity more than once before by surviving through the great famines, now they are bravely eating that extra cream bun, and fighting the temptation to take that 10 kilometre run, in order to slow down the pace of global warming. Meanwhile the gaunt, scrawny, ‘healthy’, running people are freely converting vast quantities of oxygen into CO₂ without a word of criticism. So, to counteract this, more and more people will just have to get fatter and fatter. Instead of being mocked and censured, the rotund should be praised and encouraged with prizes.

Gross errors

The stuff about creating problems for health services is simply an economic howler. The effect of rotundity on the health service should be calculated in

net not gross terms. We have to take into account that more runners and athletes, due to their chronic state of injury, will impose immense costs on health services. Bed and couch injuries tend to be less numerous, less serious and more costly than road and track injuries. Here, evidently, is another task for the carbon market to solve. Fat people, who are carbon negative because they stay at home, breathe less and store up the carbon they consume, should be allotted individual carbon credits which thin, running people would have to buy to allow them to breathe while taking their environmentally damaging exercise.

TURMoil, the movie: part 1

Talking of errors, I am able to reveal that Asinus is writing a screenplay for an epic movie about how modern energy trends in human society are leading to the apocalypse. The story begins in an awesomely large western oil company called TURMoil (standing for the Thoroughly Unmitigated Raving Maniac oil company) which sets out to destroy the world by making its pipelines leak and its production plants explode. When this becomes known, its CEO retires with an awesomely massive payoff, its share-price tumbles and the President of an awesomely vast eastern European/Asian country (Vlad Pullout) resigns to head his country’s main energy company and tries to buy out Turmoil. Another (sandier) oil country (which allegedly receives bribes to buy toy aeroplanes from TURMoil’s country of origin) also bids to buy TURMoil and so the share price soars upwards again. So, as a consolation prize, the frustrated Pullout buys Act Nicer (anag.), the biggest gas distribution company in TURMoil’s home country. Things seem to be on track for Pullout to dominate the world, basing his power on owning and controlling the lion’s share of its energy.

TURMoil, part 2: the movie inside the movie

But at this point in the story a new contender for world power, a United-statesian named Hasbeen Galore (anag.), releases an awesomely acclaimed movie about climate change, winning the coveted Sonora Campbell (anag.) award and so becoming a surprise challenger to be top world ruler. The plot now takes a completely unexpected twist, due to the curious fact that apparently in Britain all movies have to be inspected for errors by judges. Accordingly, an awesomely learned British judge rules that Galore’s movie contains 9 errors, an error being defined as something which does not ‘represent mainstream scientific opinion’. Team Galore says that 9 is not bad out of thousands and thousands of facts though his denialist critics reply that you can’t cram thousands and thousands of facts into a 90-minute movie, and that in any case there are not 9 but 35 errors. I describe this debate in such detail to demonstrate the awesome philosophic depth of the energy debates going on in human society which I try to capture in my screenplay.

Epilogue

Potential producers have so far rejected the movie on the grounds that it is too improbable but the screenplay has created quite a stir in Asinus’s own community. We remember with mixed feelings the days when a good part of the energy used by humans came from us. We would toil up mountains carrying sacks of coal, drag over-laden carts of produce to market, convey saviours into Jerusalem. You name it, we delivered it. As a result, wherever you go, you will hear donkeys expressing their amazement over the epic and awesome quality of twenty-first century energy. We call this ‘E-awe’.

Oxford Energy Forum. ISSN 0959-7727. Published by Oxford Institute for Energy Studies, 57 Woodstock Road, Oxford OX2 6FA, United Kingdom. Registered Charity 286084. Tel: (0)1865 311377. Fax: (0)1865 310527. E-Mail: forum@oxfordenergy.org EDITOR: Robert Mabro. Annual Subscription (four issues) £45/\$85/€65. © Oxford Institute for Energy Studies, 2007.

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

