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.

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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 brinksmanship 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 Kovytka) 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.

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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 Wintershall'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.

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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