

# Trends in International Energy Security – Implications for Foreign Relations, Industry and Global Markets

5 April 2006

## CONFERENCE SUMMARY

### Energy Security and Economic Interaction – Challenges for Government

#### **Malcolm Wicks MP, Minister of State for Energy, Department of Trade and Industry**

Traditional issues of energy supply are increasingly taking on the more serious nuance of national security. 2006 will be seen as a critical year for these issues as they rise to the top of all domestic and international policy agendas. The Energy Review comprises all Government departments, engages with stakeholders and key actors across the field, from business to NGOs, and is charged to report to the Prime Minister this summer.

There have been major changes to the UK and international energy context since the white paper of 2003: the need for further, rapid action on emissions; a 50% increase in fossil fuel prices in the last three years, impacting on vulnerable consumers and the competitiveness of UK companies; UK generating capacity is set to fall by 30% in the next 15 years; and increasing concerns over ES as the UK becomes a net importer of gas – 80% of UK gas demand may be imported by 2020. The Government must ensure the UK has reliable, diverse and secure suppliers. It must create an effective investment climate and manage the risks of monopoly suppliers and political instability. There must be a clear strategy to navigate these complex global challenges.

The right investment conditions must exist to access the available resources. However, the investment requirement is huge. UK markets have responded to recent developments and energy companies are making huge investments in infrastructure. Government must not distort market signals, but it must set out the energy, environmental and social goals clearly so the market can deliver them in the most economic way. The UK has seen huge benefits from energy market liberalisation, but for this to continue the Government must ensure the regulatory and consent frameworks are clear, stable and transparent, and that investment frameworks are open and non-discriminatory with respect to the location of assets/skills etc.

Multilateral agreements setting out transparent rules for investment, trade and transit are crucial in providing certainty and it is a core UK objective to push for the application of these at the G8. Moreover, the Government seeks to build new relationships to enhance diversity of energy sources and supplying countries. Although private sector investment is already producing results, the Government knows certainty is vital for investment – frameworks like the emissions-trading scheme must remain stable into the future. Competition is vital, but other EU member states have yet to put liberalisation into practice. The EC green paper prioritises the completion of the internal energy market, highlighting the need for market information and transparency and calling for effective unbundling and consistency of regulatory frameworks, as well as for a coherent strategy to engage with

producing and transit countries outside the EU. Indeed, the EU can achieve collective influence in foreign policy that individual states cannot.

Deepening producer-consumer dialogue is crucial because international cooperation allows countries to absorb shocks to the market. However, dialogue must be about enabling the market to work at its most efficient. The International Energy Forum in Doha in April represents a key forum for such dialogue, and the Government shall be pressing for greater and more reliable market information there. Consuming countries have a responsibility to give reliable information about usage factors and producing countries have a responsibility to give reliable information on availability of natural resources, likely extraction and transportation. The Joint Oil Data Initiative aims to address this issue with respect to oil, but there must be an equivalent for gas so that investors are well-placed to judge the potential business opportunities.

Much can be achieved through energy efficiency by applying existing technologies and by innovating, particularly in respect of renewable energy. Government activities in this area include the Gleneagles plan of action and the recently-published strategy for micro-generation.

The UK must promote a competitive energy market. It must identify risks, understand demand and improve efficiency to reduce poverty, improve ES and work towards a sustainable, low-carbon future globally. Few issues are more important to our economy and way of life, but the UK cannot deliver all this on its own.

## *Discussion*

### **Domestic production**

The Government works in close partnership with oil and gas explorers in UKCS (the UK Continental Shelf). Although UKCS is in decline, 40-50% of the original reserves may still exist and there will be a significant industry there for 40 or more years to come. Rising oil and gas prices also incentivise higher-cost extraction methods. It is healthy that smaller companies are now entering the field owing to the Government's tough 'use it or lose it' approach to licences. It is important to highlight the potential of UKCS in order to attract the right skills and investment in. Moreover, since Indian and Chinese economic development means the world will continue to burn huge amounts of coal, countries must develop clean-coal technologies. The UKCS is becoming a centre of excellence in this respect.

### **Planning issues**

The UK must make huge investments in energy infrastructure in the next decades as existing coal and nuclear plants are taken offline. The Energy Review considers the problem that UK consumers do not always want new plants near them and looks at the planning issues around storage for liquefied natural gas (LNG), carbon capture and storage (CCS) facilities, offshore and onshore wind terminals, and nuclear plants. The Government must respect local planning democracy, but also step in where outcomes are unreasonable. The Review has commissioned the Health and Safety Executive to complete some preparatory work on planning. Mr Wicks' personal view is that local planners should consider local issues with respect to new developments, but ought not to reinvestigate settled considerations such as plant design or the potential or otherwise of the particular technology etc.

### **Rate of progress on liberalisation in Europe**

The UK Government remains convinced that liberalisation in Europe is to the benefit of all European consumers. The EC is determined to achieve its objectives in this respect even

though particular recent events have led to the re-emergence of national energy patriotism in certain member states.

### **Physical security for energy installations**

The Government must address these concerns around physical security, particularly if they are to consider new nuclear build. Physical security must feature in the design and construction of plants as well as mechanisms once they are built. The UK has the highest standards in Europe in this respect. It is an area of growing concern for other countries, but it is hard to say yet how any EU energy policy will address this.

## **Global Perspectives and Challenges in Energy Security and Diplomacy**

### **George Kowalski, Director, UN Energy Security Forum**

The key issues driving energy policy objectives are: energy availability and security, which is seen as the EU's *raison d'être*; economic efficiency, with the aim of opening and liberalising markets rather than necessarily reducing prices, and altering the tax-take dynamic between consuming and producing-country; and environmental protection, which is now a required element of energy policy for member states.

There are also several important concerns underlying energy policy, including: high oil prices and volatility; the increasing import dependence of major consuming countries; growing reliance on OPEC and Middle East oil, with the accompanying tensions and political instability; infrastructure constraints around the gas supply chain, oil production capacity, oil refineries, and the electricity supply chain; the electric power blackouts in the US and Europe in 2003; natural gas disruptions in Europe; corporate and policy failures, such as Enron; investment risks and uncertainties, particularly with an increasing share of production moving outside Western economies; long supply routes; sabotage and terrorism; natural disasters; the concentration of oil and gas reserves; and questions about resource depletion.

With respect to trends in the energy market, fossil fuels shall remain the mainstay of generation for many decades to come because resource-depletion is not an issue – conventional oil will decline over the next 35-70 years, but the resources of non-conventional oil are huge and accessible at \$60 a barrel. Natural gas will be the fuel of choice over the medium term and the market will be increasingly global owing to LNG, but oil will remain dominant in the transport sector. The outlook for nuclear remains uncertain, but it is improving significantly, whilst the prospects for coal seem dependent on clean-coal technologies. Renewables should see significant growth, but they will not make a significant contribution to the fuel mix.

The key challenges for ES include: accelerating energy conservation and efficiency improvements, which have been slowing for years; expanding the variety of energy available, including nuclear; diversifying sources of supply, including the transport infrastructure; promoting research and development in new and alternate sources of energy, such as increased combustion efficiency, clean-coal technologies, CCS, nuclear reactors and nuclear safety, and upstream recovery; and strengthening international relations, economic cooperation and the rule of law.

Tackling ES means realising that countries are mutually dependent; a multilateral dialogue on energy is essential. It also means focusing on energy efficiency, diversification in fuel mix and sources of supply, and flexibility over sources of supply – designing plants so that they can use multiple types of fuel, for example. Moreover, ES results in a premium on energy prices.

## Global Energy Infrastructure Security – Key Issues and Future Challenges

### Paul Heuper, Senior Consultant, Petroleum Economist Ltd

Energy companies have been grappling with infrastructure security issues for decades. Approximately 1,000 significant events occur each year and in recent years more than half of these happen in Iraq and Nigeria. Tackling these requires close liaison between companies and host governments across the whole value chain. The energy sector is vulnerable to attack in a constellation of ways, from initial geophysical survey teams at risk because they do not know an area, to rebels simply stealing equipment and infrastructure from entrenched facilities. Mr Heuper presented six case studies to demonstrate the kind of risks infrastructure faces:

- Assam region in India produces 45,000 gallons of oil from 18 fields, transported through a 1,000km, 16inch-diameter trunkline. This line is highly vulnerable to attack as it mostly above ground and runs through the jungle.
- Half of Yemen's oil exports are exported through a 420km, 24inch-diameter pipeline. This pipeline has suffered 64 attacks since the late 1990s from tribal elements looking for financial reward, including bombing and strafing with automatic weapons. There have also been kidnappings.
- Algeria supplies 20% of Europe's gas supply. With the rise of the insurgency after 1992, there were a number of attacks including murdering employees and blowing up a pipeline, which cut off supplies to Europe for a week.
- At worst, Colombia was losing \$300 million in lost export and repair costs. It has hundreds of potential targets, but pipelines see the majority of attacks. US military activity in the north of the country increased activities in the south. Typically bombings occur at 19.00-20.00 to maximise response time for security services. The rupture site is normally mined and a firefight will last one to three days after discovery. Once secured, it can take up to three days to repair the damage, with spills anywhere between 10,000-20,000 barrels. Many of the villagers contracted to clean the sites associate with the rebels so the sites are frequently not cleaned. Once a site is repaired oil companies often apply chemicals to the oil they have stored at the extraction site so that it flows through the pipeline very quickly, reaching the export site before a pipeline can be damaged again.
- With the recently-reported kidnappings and major pipeline bombings, a quarter of Nigeria's production is currently halted, and the figure has been higher than this. There are a variety of security risks, primarily owing to inter-ethnic issues and policing problems. The coastal waterways of the Niger delta are especially at risk at this time and insurgency and low-intensity conflict remain the key threats. The national regime seems happy to maintain an unstable delta because this guarantees their flows of criminal funds and ensures delta states have little political influence.
- The northern and southern pipelines in Iraq have been shut down and there have been problems with offshore oil exports. Production is much lower than the Iraqi oil ministry's target. Moreover, the insurgents carrying out attacks clearly know about oil infrastructure and know precisely which targets to hit. The key issue going forward is whether it will emerge as a unified or federalised country because each has different implications for security.

It is crucial to do an accurate cost-benefit analysis for protecting oil and gas infrastructure. Risks can be mitigated by integrating security into the front-end design processes. The major risks going forward include long-term potential for low-intensity conflict, the potential for another war and violent regime change in at least one more country, and terrorism. The answer is to bring producer and consumer governments and companies together to examine past experiences from all over the world, and to focus on security and contingency planning.

## Oil Security – The Economic Concerns

### **Simon Wardell, Energy Research Manager, Global Insight**

Global demand has accelerated rapidly since the early 1990s, primarily owing to growth in India and China, whilst a variety of production problems have added to the tight market environment. OECD oil producers have been struggling for the last few quarters and although there is a forecast increase in production, much of that will come from non-OECD countries. OPEC is increasing spare capacity and increasing the price, which has increased market sensitivity and price volatility. The bulk of the expected net growth in oil production to 2020 is from the Middle East, with some from Central Asia and Sub-Saharan Africa. There are also security issues with respect to South and Central America as these poor countries see large production growth. North America, Europe and Oceania can expect reductions or low increases. This geographical shift in the production map leads to increased political risk because supply will be concentrated in the Middle East, oil consumers will become incrementally more dependent on exports from more distant producers, and a longer supply chain means more chokepoints and a greater risk of disruptions.

The changing oil industry is becoming more vulnerable to attack. The tight supply/demand balance exaggerates supply risks. The shift in production means there is a greater physical opportunity for attacks, and as the value of oil revenues rises, greater damage will be caused by any such attacks. Insurgent/terrorist groups will recognise the vulnerability and target oil installations where possible.

Oil prices have been increasingly divergent from market fundamentals. Stock movements have traditionally charted oil prices, but since the Iraq war there has been extreme divergence, which suggests the oil price is no longer tied to its fundamental supply/demand economics. Part of the reason for this is the increasing security risk and lower spare capacity. Pipeline attacks in Iraq have produced significant mini spikes in the oil price, but they have also contributed to a general surge upwards. Moreover, it seems now that any instability in countries like Saudi Arabia has a dramatic impact on the oil price.

Quantifying the risk premium in the oil price is largely educated guesswork. Ultimately, prices are always a question of supply and demand – security and geopolitical risks are concerns about future demand. The risk premium is exaggerated by a lack of spare capacity and it is difficult to isolate specific security threats within the crude price. Global Insight calculates that approximately 20-30% of the total price constitutes security and geopolitical risk.

The dramatic impact of high oil prices in the 70s and 80s was high inflation and recession. In the late 90s and the 00s high prices have led to lower growth, but the impact is less dramatic. This seems to be because Western economies are less dependent on oil than they were, they have diversified with respect to energy sources and the growth in the service sector has severed the direct link between the oil price and national economies. Nevertheless, oil still underpins the global economy. The transport industry remains heavily reliant on crude and even though there is now a greater lag, the oil price does still impact on national economies.

The global economy is now more resilient to high prices. Incremental oil demand compared with GDP is nearly half the level it was 10 years ago. For many OECD consumers the price of crude oil is a small fraction of their fuel costs. In some major emerging markets energy prices are subsidised and consumers do not 'see' higher prices. Petroleum dollars are also being recycled more quickly through investments and financial flows. There is an absence of inflationary pressures thanks to increased global and domestic competition. Moreover, as a result of prudent monetary policies, inflation expectations are relatively stable.

Global Insight has carried out analysis of how sensitive the world economy is to an oil price shock. The hypothesis was that the WTI price was over \$100 for two months, \$70 for six

months and \$50 for an additional year. The outcome was that there would be a slightly negative impact on global GDP in the first year, no impact in the second and positive impacts in the following years. The price impact shaved 0.3-0.4% off growth for China and India in years one and two. If so, what price is too high?

Concerns about ES impact on oil prices, which in turn have larger economic consequences. However, the psychological impact of 'oil jitters' on the wider economy is hard to quantify. Oil industry trends will only accentuate the impact of supply threats. The risk premium pales in comparison to the impact of a significant strike on oil infrastructure. However, it seems that big oil price movements only occur when very big events happen, and these are still rare. Moreover, economies are less dependent on oil than they have been historically and Government stocks can act as a buffer to any shocks if they are expanded.

Consider a rough analysis of the cost of oil insecurity and assume that: world GDP in 2006 is \$55 trillion, a \$20-per-barrel above-average trend reduces GDP by 0.85%, the risk premium accounts for 30% of the higher price, and 50% of the risk premium is due to security fears. If so, oil insecurity will cost the global economy \$233,750,000,000 in lost growth in 2006.

## *Discussion*

### **The risk premium and the global economy**

Energy companies are reinvesting the risk premium in financial markets rather than making infrastructure investments. Although this means there is little impact on the global economy in the short term, failure to invest in infrastructure could damage the global economy in the long term.

### **The effect of oil producers moving downstream**

Oil exporting countries are increasingly moving downstream into products to diversify their risks. The end consumer may benefit because this incentivises these countries to provide consumers with a reliable supply of their product. Indeed, the market still gives a premium to integrated oil companies even though downstream activities have little impact on their earnings-per-share figures. However, this trend only benefits consumers if there is competition in the market.

The destruction of oil products in transit has less impact than the destruction of crude oil tankers, and thus less effect on the consumer. Moreover, because LNG is unlikely to ignite on the way to a facility – only the vapours ignite and these will only be sufficient to cause damage in a tanker that has already delivered its cargo – LNG tankers are not a significant risk.

### **Insurgents and access to information**

It is tenuous to say that insurgents/terrorists acting in different countries have shared much information on how to attack energy facilities; it is primarily local knowledge. However, insurgents in Iraq and Colombia clearly have insider information with respect to facilities because they know how and where to attack for greatest effect.

### **Oil prices going forward**

Financial markets have been playing on concerns about ES, which inflates prices. Moreover, much of the analysis could be faulty in that much of the increasing energy demand in China and India will be met with coal and not oil.

The failure of oil companies to invest in new extraction methods or new discovery has also had an effect on prices. However, their investment opportunities have become very limited partly because of competition from national oil companies (NOCs), and because it is hard to determine what oil price to judge the investment cycle on – £50 or \$25? International oil

companies (IOCs) use very conservative figures to make their downside models work and investors like this.

One delegate felt it is unlikely that the world will run out of oil reserves. He also argued that the oil producers are likely to keep crude oil prices reasonably low going forward because high prices incentivise investment in non-conventional sources of oil. Thus, he believed that the major constraint going forward would be environmental issues rather than resource depletion. However, another delegate felt that the rate of demand growth is so high and the non-conventional sources of oil so expensive, that the previous view is too optimistic. He argued that the industry and investors need to see some clear audit of all energy resources and have a firm grasp of demand issues before coming to any opinion.

## Corporate Sector Perspectives on Energy Security Risks- Shell Global Scenarios

### **Wim Thomas, Head of Energy Analyses, Global Business Environment, Shell International**

Shell scenarios are plausible alternative futures designed to challenge assumptions and mitigate risk. For 15 years analysts at Shell have explored three global forces: globalisation, advancing technology and liberalisation. Enron and 11 September 2001 led to a dual crisis of market trust and ES, and states have responded with policies to deliver security, economic growth and social initiatives. The three 1995 scenarios focus on three severe deflections of previous trends: more energy for every unit of GDP growth; the investment challenge around new resources; and carbon issues and the environment.

The global economy is rapidly increasing in energy intensity, predominantly through power demand growth. Oil will remain the dominant fuel, but it will lose share to gas, and coal use will continue to grow too. Nuclear cannot provide a short-term solution and though renewables may grow extremely fast, the present policy frameworks constrain it owing to intermittency issues. It is plausible that oil demand will continue to grow quickly, but also that it will flatten out. This poses a serious investment challenge for oil companies: if they invest now will they have stranded assets in ten years? Future conventional oil discoveries will be smaller and harder to extract, but the reserves of unconventional oil are massive. However, extracting unconventional oil requires new technology, massive investment and high carbon emissions so it is unlikely to grow fast.

Political and investment issues will determine non-OPEC supply going forward, but if it were to grow quickly it would require 3% annual growth from OPEC. Will OPEC invest? Moreover, if OPEC countries start fighting for quota, the oil price will collapse. Thus, a world of high oil prices is not a necessary outcome, but OPEC market power will certainly increase in the long term and, thus, their ability to set prices.

Low demand growth means CO<sub>2</sub> levels will remain in safe limits, but higher demand growth means countries need to develop CCS in the next ten years. Companies are unlikely to invest in hydrocarbons because the technology could fall out of favour in a world where economic growth is more important. There is potentially enough renewable energy for 10 million people, but even in high growth scenarios, its total market share would only be 5-8% by 2025, and it requires huge investment.

Three forces affect Government decisions about energy: security, which involves regulation; social cohesion/justice; and economic efficiency. The scenarios represent different trade offs between these forces. 'Self-reliance' is where countries stimulate what resources they have, implement draconian measures to curb consumption, and use only NOCs. 'Open doors' is all about open and free markets where externalities are priced-in to the consumer and NOCs disappear in favour of an emerging global energy infrastructure. 'Low-trust

globalisation' is a combination of the two, where diversity of supply is crucial and national markets are interconnected, if not fully integrated. In this respect, it is crucial to understand that not everyone has the same needs/desires. The EU aspires to create an 'open doors' market, but the French definitely live in a world of 'low-trust globalisation'.

If the high growth scenario continues then companies and Government have just ten years to put the right systems/infrastructure in place. If high growth is compounded by political upheaval, they may be caught out.

## Key Strategic Energy Challenges in EBRD Countries of Operation

### **Dr Anthony Marsh, Director, Power Energy and Utilities, European Bank for Reconstruction and Development**

Since March 2003 EBRD has secured grant funding for an energy audit, financed implementation of proposed measures and offered assistance in the restructuring and purchase of emission reductions.

Energy efficiency is almost unique to transition countries. Access to energy is not the issue; psychology is. Energy is considered to be a free good (heat and power at least). There is no metering, no payment and no disconnections. It is delivered below cost and the environmental impact is not considered. However, there is an increasing awareness that energy efficiency is a transition country's most abundant natural resource.

The situation in transition countries is changing owing to: rising fossil fuel prices; the need for a competitive domestic industry; EU legislation around buildings etc; Kyoto targets and the emissions-trading scheme – transition countries have large surpluses and carbon prices are increasing; security of supply; import substitution; and the closure of unsafe nuclear power plants. Even Russia has focused on energy efficiency because: it is concerned about the competitiveness of its global industry; it wishes to free up gas for export at high prices; it is concerned about internal ES; it has ratified the Kyoto Protocol; and doing this is cheaper than new generation.

EBRD industrial energy efficiency projects since 2002 have made energy savings per annum equivalent to the consumption of the city of Leeds and CO<sub>2</sub> savings per annum equivalent to the CO<sub>2</sub> emitted by Birmingham households. A conservative estimate of the potential for GHG emission reduction in the industrial sector in EBRD's region is 135 million tonnes of CO<sub>2</sub> per annum. This is equivalent to 25% of UK emissions, three times Ireland's emissions, and the emissions of Bulgaria and Romania combined. Here are some case studies:

- EBRD provided a \$10 million loan to back the first privately-owned Ukrainian energy services company, The Energy Alliance. It follows a lease-finance structure giving clients the full benefit of assets without upfront purchase of equipment. The first project was construction of a 4MW co-generation plant powered by sunflower seeds.
- EBRD provided €34 million to finance Dalkia Polkas in acquiring the Poznan district heating network and subsequently Poznan CHP (combined heat and power), privatised by the Polish Treasury. Successive acquisition of network and CHP created the first consolidation of heat generation and distribution assets in Poland, maximising efficiency gains. The investment programme includes expansion of the district heating network, efficiency improvements and extending metering.
- EBRD provided a \$50 million credit line with Bulgarian banks for on-lending to the private sector for energy efficiency and renewable energy projects. The loan was complemented with a \$10 million sum from the Kozluduy International Decommissioning Support Fund. 14 projects have already been financed, including hydro, geothermal, biomass and equipment refurbishment.

- EBRD provided a \$160 million loan to the largest ammonia producer in the former Soviet Union, operating seven plants in Togliatti for revamping their ammonia unit. It was a senior A + B loan structure to modernise ammonia production units and finance expansion. This led to a 20% reduction in gas consumption for Russia's largest domestic gas producer and a carbon reduction greater than 550,000 tonnes of CO<sub>2</sub> per annum.

EBRD stimulates energy efficiency through the work of its dedicated energy efficiency team who pioneer efficiency projects and promote good practice. EBRD are specialists in project financing, carbon finance and energy engineering.

EBRD monetises carbon credits. EBRD manages the Dutch Carbon Fund and is creating a multilateral carbon fund. EBRD will purchase carbon credits from the EU emissions-trading scheme, the Joint Implementation Project and the Clean Development Mechanism in Bank-financed projects. EBRD has in-house expertise to guide clients through monetisation of carbon.

EBRD mobilises technical assistance through access to government funding. Funds are available for market studies, project feasibility, technical cooperation etc. Moreover, EBRD is assisting committed sponsors in early project-development phases.

EBRD is flexible. It provides a wide palette of financial instruments, offers longer tenures than market norms and partners with organisations at an earlier stage. It also invests with both public and private organisations and engages with government bodies on projects and policy.

## Power Generation – Strategic Investment Issues

### **Simon Vasey, Director of Trading, EON UK**

The three key energy policy dilemmas in Western Europe are ES, the economic impact on companies and fuel-poor consumers, and the environment. A recent problem with one EON plant meant it appeared the firm was about to breach annual sulphur limits at a time when it had just announced insufficient system margin. Mr Vasey made the decision to keep the plant open, but he reported strong internal pressure with respect to the environment and did not believe he would make the same decision again. Moreover, he reported approaching a French company during a period last November when gas demand jumped dramatically. He found this company would not sell him gas for political reasons – gas storage is politically important in France – and because the representative he spoke to believed it was preferable to see Britain desperate before selling gas to them.

The market is good at delivering optimisation, but not long-term infrastructure investment. The European carbon market was a great success for traders, but a political disaster: high oil prices meant utilities were burning more coal, in turn driving carbon prices up. The carbon market as currently configured offers investors no confidence over the sort of timescales necessary to drive infrastructure investment. Private utilities seek profit and given enormous market volatility, they will charge a high price for delivering new assets. However, most European utilities now operate with a cross-border perspective and a stakeholder, rather than a shareholder, culture. Thus, EON is investing in storage, CCS, new interconnectors etc. Utilities are not perfect, but EON constantly debates internally and externally what is the best thing to do and seeks further participation in similar forums.

## Discussion

### Global resource-decline rates

Most analysts calculate the underlying global resource-decline rate at 3-4%. However, nobody is certain because it depends how much investment goes into extraction, particularly at the tail-end of a facility's lifecycle.

### Energy sector recruitment

The lack of young people entering the energy sector is primarily a Western problem. For instance, there is little problem finding young people with expertise across all parts of the sector, including nuclear, in India and China.

### Unbundling

The success of unbundling in the UK is compelling. It is likely to happen throughout the EU because a successful energy sector is crucial to the success of the EU. Unbundling is successful because it exposes the flaws in companies' business models and because it dissolves conflicts of interests, incentivising monopoly providers to open their markets to new entrants. However, since unbundling requires a very different business model to make it work, it is difficult to see it happening quickly in other member states.

### Issues around Gazprom

If Gazprom were to own British consumers, Britain will still be able to cap prices and determine taxes etc. Moreover, if Gazprom were to own customers here, they would arguably have a greater incentive to ensure gas arrives in the UK.

The EBRD believe Gazprom moving away from third-party access and liberalisation. However, the silver lining is that this has driven former Soviet states to focus on energy efficiency and renewables.

## The Role of Financial Institutions in Mitigating Energy Security Risks – Key Challenges in the Sector

### Scale and Risks in Financing Global Energy Investments

#### William Vereker, Head, European Energy and Utilities, Lehman Brothers

There is a pressing need for infrastructure investment to assure security of supply. There is no constraint on the availability of financing to meet these needs. The issue is rather the framework put in place to create the right conditions to meet investment objectives. If left entirely to the market, investments will be short term. If the Government wishes to see longer-term investments, policymakers must consider which levers to pull to stimulate private-sector investment.

The energy demand/supply gap is expected to widen to significant levels by 2050. The reserve margins for UK generation are very thin and the UK and Europe are increasingly dependent on gas imports. It is odd then that most new investment is focused on gas until one considers that the market predictably gravitates towards the simplest investment for a short-term fix. Major generation and gas infrastructure investment are required to ensure future security of supply.

70% of global oil and gas reserves are in the hands of six producing countries. The Government should take several steps to ensure long-term security of supply and less dependence on imported fuel. It ought to diversify gas fuel sources now and plan for the

longer-term around developing new sources of technology, new abilities to meet demand. These could include alternative types of gas, but also clean-coal technologies, renewables and nuclear.

There are three constraints on investment in new technologies at the moment. First, there is an unclear planning and approval process for most new technologies – the length of time, outcome and regulatory process are uncertain, and projects are liable to be stalled. Second, there is a lack of a clear policy framework with respect to incentives, carbon allocation etc, with even less clarity with respect to Government willingness to backstop certain risks. Moreover, there is no EU-wide policy framework. Third, there is market structure: Government control over some energy markets adds political risk; the lack of interconnection leads to price volatility in 'island' markets; and emerging national champions create barriers to entry.

Resolving the planning issues requires that Government assist by expediting the planning permission process and underwriting costs in the event of delay or failure.

Resolving the policy issues requires: clear EU-wide joint initiatives to promote new technologies; a clearly-defined carbon-permitting framework for Phase II and III; carbon used to create an incentive revenue stream for new/desired technologies; and Government willingness to backstop some risks.

Resolving the market structure issues requires: new investment to increase interconnection capacity; incentives for transmission system operators to comply; and scrutiny of consolidation activity. A level playing field is essential.

With that framework in place, the financing is readily available – the financing is the output of the framework. Policymakers need to ask what objectives they have for the investments they would like to see. They do not need to invest themselves, but they do need to create the necessary investment conditions. To what extent are the policymakers willing to involve themselves in that at this point?

## Interaction of Energy Security Risks and Credit Ratings

### **Peter Kernan, Head of European Utilities, Standard & Poors**

Overall the EU power supply has been secure, but import dependency is increasing. Supply risk will not be a significant direct mid-term threat to European utility credit ratings, which are generally AA – i.e. the risk of default is deemed negligible. However, security of supply will drive M&A and investment, which can impact on ratings. The ratings of utilities based in the EU15 have trended downwards owing to liberalisation and subsequent M&A activity. In contrast, the ratings of Eastern European utilities are generally on an improving trajectory, albeit from a low base.

Financial strength, market power and capital market access are key elements in mitigating security of supply risk. Utilities with these features are the biggest and most diversified companies, and this will drive consolidation in the market. In a situation of tight global commodity supply, strong demand hits through prices. In liberalised markets generators with market power can (partially) pass these cost increases through to the end consumer. In less liberalised markets a squeeze on margins is more likely. Diversity of generation (coal, gas, renewables, hydro, nuclear etc) and fuel sourcing (multiple supply points and storage facilities) is essential in dealing with tight commodity markets. Mr Kernan argued that Gazprom will continue to be a very reliable supplier because it is in mutual dependence with Europe. However, diversification is required to counter Gazprom's increasing market power.

There are three key challenges for policymakers. The first is security of supply. Generation and sourcing diversity are vital in countering the risks posed by increasing import

dependency. The second is liberalisation, which boosts efficiency, but creates market risk. Regulatory certainty and a clear competition framework are vital to encourage investment. The third is climate change policy. This favours CO<sub>2</sub>-clean generation, but there are policy uncertainties in this area that are delaying investment.

Energy security risk is not expected to be a significant risk driver. Security risk will drive M&A. Policy dexterity is the key to avoiding conflicting goals and uncertainty. Eastern European performance risk shall further reduce as those economies mature.

## The Future of Risk Financing and Insurance in the Energy Sector

### Stuart Brown, MD Capital Solutions, Swiss Re

Think of reinsurance as the wholesale end of the insurance business. The spending plans of major energy companies are massively capital intensive. If an energy company were to suffer a large loss, it could raise this sum as a loan from the capital markets, dramatically damaging its credit rating, or cut its capital spending, dramatically reducing its competitiveness. Thus, reinsurers support the energy world with a form of capital, taking some of the risk from Governments and shareholders, facilitating capital flows into the energy companies.

The threat to the energy industry is climate change. Whatever the reason for this phenomenon, the 2005 hurricane season was a real shock to the global insurance market. For example, Oil Insurance Ltd is a club of 83 oil companies that take each others' risks and pay each others' losses. They agreed that the limit on individual losses ought to be \$250 million. They managed that risk by agreeing to pay no more than \$1 billion on any single event. This seemed reasonable to all parties. Hurricane Katrina cost \$2 billion and hurricane Rita \$1 billion. All insurance firms were hit badly, and the ramifications of the loss are having a catastrophic impact on costs – premiums for some cover have increased four times and there is no cover at all for other kinds of risk. This is very difficult for energy companies because insurance premiums are a non-trivial part of their cost-base. The situation has impacted energy plans and energy supply, and, thence, cost and security for consumers.

Financial markets are beginning add capital capacity to the energy industry by securitising insurable risk, rather in the way they do with mortgages or consumer debt – instead of paying an insurer to cover claims, firms issue securities, put the cash in a drawer and if a loss occurs, they do not have to pay it back. Most energy companies felt 'catastrophe bonds' were an extremely expensive way to produce insurance until recently. Now that insurers are ever more reluctant to insure certain risks, catastrophe bonds are becoming ever more attractive. Indeed, there is some scope for traditionally uninsurable risks such as terrorism to be securitised too – FIFA undertook a transaction to protect them against cancelling the World Cup.

Although the market structure is changing, it will continue to support this capital-hungry industry.

## Strategic Risk Management Strategies – Future Expectations

### Nigel Alington, Head of Political Risk, IRMG Risk Consulting, AON Ltd

The risk management process developed and refined over many years by both public and private bodies is applicable to managing issues of ES. First, governments must determine the public's tolerance to risk, and also the critical aspects of the supply chain. The second stage is identifying threats, which involves a comprehensive appraisal rather than simply being reactive – consider the advance in nuclear technology versus public concern over the technology. The third stage is evaluating the likelihood of particular events and their

economic costs. It is very difficult to quantify impact or probability, but an imperfect calculation is better than none because some cost-benefit analysis is necessary. The fourth stage involves applying the criteria for risk tolerance established when assessing society's appetite for risk at the beginning of the process, and then identifying which risks are acceptable, which must be reduced and which must be avoided altogether. The fifth stage involves mitigating those risks, and undertaking crisis and continuity planning.

Risk mitigation means diversifying supply sources, energy sources/utilisation, and supply routes/methods. It also means multilateral engagement, energy efficiency and reduced consumption, investment in technological development, improved security at home and overseas, and creating strategic reserves. OECD countries have only a very small share of the world's oil and natural gas resources, but 41% of its coal and 55% of its uranium. However, the world has been consuming more uranium than it is producing since 1965 and reserves are now almost depleted. Thus, nuclear power is not necessarily a hedge against supply issues arising with other fuels.

Crisis management and continuity planning means scenario planning, identifying early warning signals, creating monitoring, reporting and escalating mechanisms, and designating responsibilities and accountability. Moreover, continuity plans need to be flexible and dynamic to accommodate change in the geopolitical climate as well as to personnel etc.

Implementation means having strong commitment and leadership from Government and industry. It means establishing processes for implementation, maintenance and review. Industry and Government need to liaise and cooperate on a continuing basis, and allocate responsibilities between themselves. There are strong lines of communication between Government and industry at the moment, but these must continue after the Energy Review is complete.

Managing ES requires a strategic framework that is based on a comprehensive view, but that identifies and focuses on key threats. Risk must be quantified and responses to crisis must be planned. Industry and Government must liaise and cooperate.

## *Discussion*

### **Diversification and the investment cycle**

Boom-bust is a consequence of market short-termism – when capacity is scarce, the market will build the quickest and easiest technology, which happened to be gas plants. Thus, energy economics became concentrated on a single fuel source. Moreover, because gas cannot be stored, the price is very volatile, exacerbated by the price structure in Europe generally. Diversification is necessary to counter this, but it will not occur without a policy framework that incentivises longer-term market choices.

### **Investment and political instability**

The market is cautious about infrastructure investment because of the potential for political/regulatory change. The uncertainty with respect to carbon allocations is a real barrier to investment at this time. Since politicians almost always have a shorter span than the required investment horizons, they must make clear commitments not to change the rules or to backstop any changes, offering companies price recovery, for instance. However, companies will never be able to avoid all political risk and those best suited to absorbing it are those with the largest scale and diversity, the highly-rated companies with greatest access to capital.

### **Quantifying diversification**

Potentially, there are huge costs involved in diversification and these have to be measured carefully. Insurers are in the business of pricing and valuing diversification – they precisely

analyse the value of diversifying or spreading risks. However, there remains some fuzziness in any attempt to quantify such risks accurately. Indeed, the private and public sectors share a desire to sometimes overemphasise their ability to quantify risk.

### **Diversification and renewables**

Renewables are potentially as distinct from one another as oil and gas, and thus ought not to be considered all together when compared with other fuel sources.

### **Barriers to communication between Government and investors**

The private sector frequently only approaches Government when it wants something and this does not make Government more responsive to it. Thus, the market must demonstrate to Government that it has mutual concerns, that it is willing to contribute to solving the problem, and that it simply wishes to discuss the kind of mechanisms and allocations of responsibilities necessary to do this. There is no reluctance in Government to have this discussion at the moment. However, the market must make sure that the subject remains at the top of the political agenda once the Energy Review is complete.

## **Developing Solutions to the Energy Security Threat**

### **Understanding and Managing Business Risk**

#### **Richard Sharman, Partner, Risk Advisory Services, KPMG**

Energy companies have risk profiles of incredible breadth and depth. It is crucial to identify and examine all risks in part because energy companies are committed to undertake corporate risk strategies – to maintain supply – and also because it is necessary to do this to understand how the risks interrelate with one another. Historically, energy companies have managed risk well. However, it is common for companies to manage risks with a silo-mentality – i.e. with very specific responses to very specific risks. Many energy companies are now looking to coordinate their approach to risk in order to achieve better value for the actions they take.

Effective coordinated risk management means generating ‘content’ and ‘process’. Content means redesigning risk assessments, integrating information from all risk disciplines, and crucially making disclosure of risk management transparent and meaningful. Because many risks emerge from outside the companies, companies also need to create a sustainable internal process to keep risk information alive. This means linking assurance activities to business risks, implementing new processes for achieving consistency and using technology to streamline management effort.

Developing risk content means creating risk maps, which identify the threat-level for every risk, as well as how likely it is to occur. Although it is important to quantify all risks where possible, this risk-mapping approach enables firms to incorporate unquantifiable risks too. Once companies have this information, they think about how to embed it into their organisation by incorporating it into day-to-day risk management and business practices.

Energy companies achieve long-term, sustainable improvement in risk management when they create flexible frameworks. The risk environment is so dynamic that specific measures need to be able to change. KPMG believe such frameworks must include mechanisms for: risk governance, risk assessment, risk quantification, monitoring and reporting, and risk and control optimisation. Several companies have begun to develop advanced versions of all these mechanisms. They are doing this for all the reasons discussed today, but also because of regulatory pressure and because understanding their risks better makes good business sense.

Risk covers a broad range of issues. KPMG's experience in the energy sector suggests that companies often have strong risk practices in silos, and they need a framework to look at risk in a more coordinated manner. Companies need to have a system that identifies and controls short and long-term risks from all sources.

## Security Management of Energy Infrastructure

### **Dr David Claridge, Managing Director, Janusian Security Risk Management**

Janusian is a security and political risk consultancy, and an operational security company with assets in the Middle East, Asia, Africa and the former Soviet Union. It is a specialist in terrorism risk and assisting clients operating in higher risk environments. It is a service provider to a number of multinational corporates and international lenders, and it is part of The Risk Advisory Group plc.

The first issue to consider in protecting your infrastructure is precisely what you are seeking to protect. Is it: exploration and drilling operations; production, generation and refinery operations; pipelines and transmission lines, transportation; or downstream points of delivery? Energy infrastructure is extremely varied in nature as are the protective requirements, which are frequently long-term and large. The second issue to consider concerns the location you are seeking to protect. Is it the developed world or is it the developing world, where you may have to consider conflict zones, post-conflict or high-terrorism-threat locations, or politically-challenging and higher-criminality environments? Is it hostile, remote or urban? There are a massive variety of locations with a host of different challenges. The third issue to consider concerns what threats you are seeking to protect yourself from. Are they: situational events arising from conflict zones; local insurgencies; international or jihadist terrorism; siphoning from pipelines; sabotage, vandalism and theft; protest; or corruption, fraud and semi-official threats?

There are several basic elements in developing an effective security strategy. The first is risk assessment. This means assessing: how critical the infrastructure you wish to protect is; the motivations, capabilities and probabilities for each risk; identifying vulnerabilities with conventional surveys, scenario planning and possibly simulating attacks to test your resilience; determining the consequences; prioritising responses; and then developing mitigation strategies. You should also remember issues around interdependence because energy supply involves networks.

The second basic element is managing your risks. Are you regulated, assisted or unregulated? Many firms participate voluntarily in principles on security and human rights. You must create the right management structure, which includes corporate experience, but also people with on-the-ground decision-making skills. Here you will have to weigh up security versus business needs. The right people mix should include the conventional ex-military and police staff, but also security experts, people with local knowledge, people with liaison capabilities, and people who are acceptable within that environment. You should consider whether you wish to be high or low profile in managing these risks, and whether security should be an issue that is part of your corporate culture as a whole or whether it is best that it remain a separate concern.

The third basic element is considering your physical security. It is best to create a physical barrier wherever possible, which may include: a fence and gates; procedures for entry and then internal layers of security; a guard force, which requires vetting and managing, with effective training and standards; assistance from local security forces; effective communications; and engagement with the local community. However, where you cannot erect a physical barrier, you must take other measures, such as patrolling, surveillance and possibly creating a quick reaction force.

After you have done all this, you should consider how to deepen your perimeters, always considering the four key criteria of good security: deter, detect, delay and respond.

Creating an integrated security strategy requires soft measures, such as: gathering both strategic and tactical intelligence; creating 'alert states'; developing good relations with the local community through social/environmental programmes, your recruitment policy, and network building; public relations, which includes setting the agenda, engaging with NGOs and deflecting criticism; impact assessments and responses; and home government support. An integrated strategy also requires 'intermediate measures', such as: liaison with security forces; creating clear zones; psychological or deceptive measures; counter intelligence, surveillance and reconnaissance, including aerial surveillance if necessary; electronic measures such as CCTV and tracking systems; and security training for non-specialist personnel. Finally, an integrated strategy requires hard measures, such as: locating assets to minimise vulnerability and maximise response capability; make security visible; developing and testing response plans with respect to security force actions, non-security personnel, medical and environmental considerations, communications, hostage situations and site evacuations; and network resilience, which means thinking about duplication, spare capacity and interconnectivity. Moreover, you must always remember to test, reassess and then re-plan.

Effective security means gathering intelligence and using it. It means reaching out as well as looking out. You should manage security in response to threat levels, assess and test vulnerabilities, practice openness and deception, and maintain a low profile without losing your ability to respond. Security managers should share responsibility for security with other disciplines. Using local manpower can minimise insider threats, but they must work to well-defined standards. That way, you can develop perimeters that stretch to the horizon.

## Managing Industrial Control System Security Risks

### Justin Lowe, Managing Consultant, PA Consulting Group

Industrial control systems are known by a variety of names and are involved in power generation and distribution, oil and gas refining and distribution, water and waste management systems, chemical processing and transport, manufacturing and transportation. They are becoming increasingly vulnerable to cyber attack owing to the move away from bespoke applications to the adoption of standard IT technologies. These vulnerable systems are increasingly exposed to the wider cyber world too. Internet access is now ubiquitous, and additional corporate connectivity provides access to the production information that allows process optimisation and supply-chain management – i.e. connectivity for control system vendors, and supply-chain business-to-business systems.

The wider cyber world is becoming increasingly hostile, with vulnerabilities being discovered at an ever increasing rate. It is becoming increasingly difficult and costly to patch IT systems to fix these vulnerabilities. These vulnerabilities are also being exploited more quickly in attacks and self-propagating worms. Worms are becoming more frequent. They are capable of infecting global networks within minutes and are now attacking functions of the core operating system. Moreover, hackers are beginning to focus on embedded systems and process control. The types of threat energy companies face include the standard ones – unauthorised control, loss of integrity and loss of confidentiality – but also, significantly, denial of service. The sources of these threats are hackers, worms, traditional viruses and accidents.

The business impacts of cyber attack cannot be ignored. The obvious impact is the financial consequences of disruption to production or operations, but there are other consequences, including: environmental impacts, health and safety, inability to honour client commitments, loss of reputation, non-compliance with regulation, threat to operating licence, and damage

to plants etc. Process control security incidents are real. Examples include: a disgruntled ex-employee who attacked a sewage control system and released millions of gallons of sewage into a river and hotel grounds; hackers controlling Gazprom's pipeline for 24 hours; the blaster worm contributing to the US power outage; control systems infected by viruses from contractors' laptops; vendors' update disks containing viruses; and a programme code that was written to the wrong PC and caused an environmental incident.

Although it is difficult to get honest data on incidents, the number of major incidents appears to peak in 2003. Such incidents can be very expensive, costing up to \$10 million – the average cost is \$1.8 million, but the data sample of quantified incidents is too small yet to be statistically relevant. Moreover, going forward, the hackers are waking up to new possibilities. At one conference a hacker gave a detailed breakdown of how UK water management systems can be abused, whilst at another a hacker gave a detailed analysis of how to attack a particular type of process control infrastructure.

Solving the problem is not simply a matter of extending the IT department's security policy. The process control IT environment and the 'standard' corporate IT environment have some significant differences. This means that some of the standard approaches do not work or are not applicable. Thus, there are several key features of a good practice guide for process control security: 1) understand the business risk; 2) implement security improvements, both quick wins and longer-term measures; 3) establish response capability; 4) improve levels of awareness and skills; 5) manage third-party risks; 6) engage projects; and 7) establish ongoing governance. Companies ought also to update their policies and standards regularly based on current threats, and assure ongoing compliance with these policies and standards.

## Strategic Challenges for European Energy Supply – Strengths, Weaknesses, Opportunities and Threats

### **Richard Greenwood, Energy Policy and Security of Supply Unit, European Commission**

Energy was an important driver of initial European integration. More recently, in 2003, the draft Constitutional Treaty proposed an article on energy. In 2005 the G8 summit accorded new priority to energy and then later the EU heads of state and government called for a common energy policy. EU import dependency is set to rise dramatically over the next 25 years, particularly for coal and natural gas, whilst natural gas and renewables will significantly increase as a proportion of energy demand.

There are several reasons for a common EU approach to energy: to equip the EU to play a full role in global markets; to improve sustainability in the EU and globally; to improve the functioning of the internal market; to improve stability in the EU and neighbouring markets; and to reflect the strategic role of energy in achieving other political objectives. There are also three common energy goals: competition, environment and security of supply. The goal of competitiveness involves activities around internal market competition, interconnections, the European electricity grid, and research and innovation with respect to clean coal, alternative fuels, energy efficiency etc. The environmental goal involves activities around renewable energy, energy efficiency, nuclear power, emission trading, research and innovation etc. The goal around security of supply involves activities around international dialogue, European stock management, refining capacity and energy storage, and protection against terrorism etc.

Recent evidence shows that the EU is not doing well with respect to meeting its Kyoto emissions targets. This is particularly important considering that these targets are already modest if the objective is genuinely to reduce climate change.

The green paper offers six priority areas for possible common action: moving towards a fully competitive internal market; solidarity amongst members in terms of internal energy supply policy; a diverse, efficient and sustainable energy mix; an integrated approach to tackling climate change, including energy efficiency measures and renewable and low-carbon energy production; a strategic approach to technology and innovation; and a coherent external energy policy.

The green paper contains several proposals for discussion in respect of an internal energy supply policy: full development of internal gas and electricity markets; a strategic review of the EU energy mix; a European energy supply observatory; an action plan on energy efficiency; a road map for renewable energy; a strategic energy technology plan; and a common regulatory framework for the EU's internal gas and electricity markets.

The green paper contains several proposals for discussion in respect of solidarity in an internal market: improved network security; a new mechanism to ensure solidarity and assistance in the event of damage to infrastructure; a priority list for new infrastructure; a rapid and coordinated reaction to emergency external energy supply events; a review of the existing Community approach to oil and gas stocks; and common security standards to protect essential energy infrastructure.

The green paper contains several proposals for discussion in respect of an external energy supply policy: a comprehensive and strategic EU energy review; an international agreement on energy efficiency; a pan-European 'Energy Community Treaty'; rapid ratification of the EU Energy Charter Treaty and conclusion of the Transit Protocol; limiting the EU's growing dependence on imported fuels; and leadership on climate change and the search for energy solutions.

President Barroso's presentation at the Spring Summit and the Energy Council debate will inform these issues further. The green paper remains a priority for forthcoming presidencies and the European Parliament. Following the EC's consultation phase, the EC will develop specific priorities, instruments and impact assessments leading to a strategic EU energy review.

## *Discussion*

### **Government funding**

Different Governments are taking different approaches to funding energy investment. For example, whilst the US administration is actively supporting its energy companies, the UK Government use the language of debate and facilitation and do not propose any funding.

### **Diversification and security of supply**

The EC believe diversification of fuel sources, producers and transit routes etc is the primary way of enhancing security of supply. The EU25 have determined certain 'Community competences', one of which is trade. Activities in respect of these competences must be decided at EU level by all member states, and then all are bound by the decision. Thus, the EU has considerable clout with respect to decisions about how member states transact energy business with producing countries.

### **Best practice**

Most of the energy companies that come close to best practice in respect of strategic ES are very large. However, companies must decide how to proceed based on the needs of their company. It is not necessary for all companies to aspire to best practice.

**Russia and the EU – The Charter Treaty and the Transit Protocol**

Some Russians are reluctant about energy market liberalisation whilst others believe a more competitive structure is beneficial. The Energy Charter Treaty is likely to enhance inward investment. The Russian Government has technical concerns in respect of the Transit Protocol and does not wish to ratify the Treaty until these are resolved. The EC is working hard to find solutions. Moreover, the Russians are under great pressure in the G8 to ratify the Treaty and the Protocol. However, neither the Treaty nor the Protocol determines the structure of how energy is supplied within individual countries. Gazprom is likely to remain unbundled for a considerable time even after Russia ratifies the Treaty and the Protocol.

*CL, WEF - 18 April 06 – version 1*