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Can we expect an energy crisis with serious economic, social and, inevitably, political consequences to hit the world sometime in the foreseeable future? Governments of OECD countries and some developing nations appear to be increasingly worried about such possibilities. Witness the recent publications of reports on energy strategy, reviews of energy policies and other official documents emanating from the EU, the UK, France, Japan and several from the USA.

There are many dimensions to the energy problem which policy makers seek to address.

First, there is the security of oil and gas supplies, a particular concern of countries dependent on imports. While international trade is hailed as an engine of economic growth and a provider of welfare, importing fuels causes worries on the grounds that many exporting countries are vulnerable to disruptive political events.

Energy supply disruptions can also be caused by technical accidents or constraints on production and transport facilities due to insufficient investment in capacity or lack of careful maintenance. This does not only affect oil and gas supplies internationally but electricity generated and transmitted domestically.

Secondly, the impact of carbon emissions on the climate from burning fossil fuels raises difficult questions about fuel choice and a broad range of policies for dealing with carbon.

Thirdly, there is the possibility that in the long run oil and gas, both depletable resources, will become increasingly scarce and lead to final production peaks. How can one cope with this eventuality?

We have here four contributions which selectively treat a few aspects of this vast subject. John Mitchell discusses the EU strategy. The security of electricity supplies calls for investments but there is no clarity about the fuels that should be chosen for the new capacities in generation. He argues cogently that fears about import dependence and the use of oil or gas as a political weapon are exaggerated. The international oil market is both open and flexible and as such offers much protection. This is not yet the case for gas however.

Tera Allas argues that reliance on

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market forces which is central to the UK approach is sensible and effective. She recognises that markets suffer from imperfections which need government attention but do not justify heavy intervention or public sector investments.

A contrary view relating to one energy – oil and gas production in the North Sea – is proposed by Peter Odell. He laments that the full production potential of the UKCS is not realised, largely because oil companies seek a high rate of return on their investments and are burdened with heavy taxes. His proposal is a private/public partnership scheme in which both companies and the government will invest together. As government requires a much lower rate of return than private companies, more money will go into the development of fields pushing the production boundary higher on the rising marginal cost curve. An idea which calls for discussion and debate, for which the columns of this journal are open to our reader.

Olivier Appert presents an overview of French energy policy reminding us that France's concerns with security go back several decades. There was recently a dramatic change in this approach, a shift from considerable reliance on public sector ownership and wide-ranging government intervention to privatisation and liberalisation. Policies are in place however to encourage investment in energy efficiency and renewables and promote R&D.

The second group of articles is composed of two contributions, one by David Fridley and the second by Benito Müller. They illustrate how a number of US states (California and a group of North Eastern ones) are introducing environmental policies that imply a very different position than that held by the Federal government. The interesting question is whether progress on environmental questions at the state level will gain enough momentum to induce a fundamental change of attitude in Washington.

This issue also includes one article on a different topic. Joe Stanislaw shows that serious challenges were already facing the world thirty years ago and little was done to address them. He asks whether we are going to waste another thirty years not doing enough to reduce dependence on hydrocarbons for both environmental and supply considerations. He advocates strong and continuous action and international cooperation between countries, a necessary condition for effectiveness of policies in a global world.

Adrián Lajous has a contribution to the rubric labelled personal commentary, where personalities of the energy world relate their experience of a significant event. Adrián with the PEMEX CEO and three other colleagues were in September 1985 at the Oxford Energy Seminar when Sheikh Yamani announced that Saudi Arabia will cease to play the swing producer role. The netback pricing system was introduced. Adrian and his colleague Pedro Haas realised that this was the declaration of a price war. They set up a team of experts who developed the pricing formula system which Mexico introduced in 1986 and has been widely adopted ever since.

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Energy Policy

John Mitchell considers EU policies on energy supply security

EU policies on energy security are 'work in progress'. The Green Paper of March 2006 (*A European Strategy for Sustainable, Competitive and Secure Energy*, COM(2006)105) was followed by an Energy Council discussion on 14 March 2006 which initiated a consultation process which should lead to a Strategic Review to be completed in 2006 for an Action Plan to be adopted by the Council in spring 2007. Xavier Solana, the High Representative and Secretary General of the Council has submitted a paper to the European Council (of heads of governments) on external energy risks and how these can be better managed by use of the EU's emerging Common Foreign and Security Policy (CFSP). The Green Paper is also being reviewed by the European Parliament Committee on Industry, External Trade, Research and Energy: the action plan (if it has substance) is likely to include some actions that require parliamentary approval or through the co-operation or co-decision process.

Like most EU communications, these texts reflect the tensions between the Commission, with its limited powers of initiative and direction, and the Council, composed of national governments, with the Parliament on the fringes. Like all EU communications on energy, it also reflects the lack of clear Treaty authority for Union-level actions in energy, unless these are based on more general Treaty provisions such as external trade, the internal market or competition.

Those concerned with energy supply security therefore face the double challenge of identifying what appropriate policies for Europe might be, and then how to advance those policies through the decision-making processes.

Electricity

For many consumers, energy means electricity. Of Europe's energy supplies, 40 percent go to generate and distribute electricity. Final consumers want electricity that comes on at the flick of a switch. The switches did not work in the US East Coast and Canadian blackouts of 2003, the Italian blackouts of 2003, and recent blackouts in Chicago, Honolulu, New York and New Zealand. They are remembered as exceptions. In the last two months there have also been prolonged and disruptive blackouts in 19 other countries. Such disruptions affect households, damage the economy and may cause deaths.

These blackouts were not caused by lack of fuel supplies. Either the management of the network failed or there was not enough spare capacity in the network or the generating system, or both. The liberalisation of the European electricity market should improve the ability of the existing capacity to respond to local disruptions. However, few countries have yet achieved full liberalisation at the consumer level, as required (for January 2007) by the 2003 Electricity Directive.

The Commission apparently intends to pursue the completion of the single market structure, to promote improved technical interconnectivity and to enhance the financial assistance available for Trans-European Networks (TENS).

Policies are less clear for investment in new generation plant, which requires a choice of fuel and a prediction of the likely load factor. The fuel mix is regarded by many governments (and the Commission) as a legitimate sphere for government decision. According to Andris Piebalgs, the forthcoming Strategy Review will suggest a 'benchmark objective to maintain or achieve a minimum level of overall EU energy mix from secure or indigenous and low-carbon energy sources'. How to judge reality against so vague a target will be a puzzle. There are difficult issues: how will nuclear be treated, given the extreme differences in approach between France and Germany, with the UK somewhere between? Specifically, will nuclear be recognised as a low-carbon fuel for the purpose of emissions caps and financial incentives?

There are similar policy uncertainties for coal, which at present and likely future oil and gas prices would obviously be the fuel of choice for new base load plants if there were no penalties for CO_2 emissions. The future prices for carbon emission permits depend on the severity of the caps on emission in the second trading period (2008–2012) and on what system will exist after 2012.

Meanwhile, national mandates should increase the share of 'renewable' primary energy input from 14 percent in 2004 to 21 percent in 2010 across Europe. The higher proportion of intermittent supplies will increase the complexity of balancing loads and the need for spare 'reliable' capacity.

Storage and Shocks

EU Directives require the oil industry to hold storage equivalent to 90 days consumption for use in emergencies. At present, the electricity sector takes only about 6 percent of Europe's oil supplies. Gas is a more important question. Just under 30 percent of gas supplies go to electricity and this proportion is projected to increase slightly. The Commission is canvassing the idea of compulsory stocks for gas. It would be controversial whether such storage would be under the control of the Commission or of national governments.

The single European market for gas is far from complete. The UK experience last winter showed that despite a high premium for gas in the UK, following a fire at the Rough (storage) field, supplies to fill the interconnecting pipeline from the content did not appear. The Commission is addressing

this issue through implementation of the 2003 Gas Directive and through investigations under competition law. Meanwhile, the UK is looking for solutions that rely less on the single market. The UK consultation paper published on 16 October envisages extending to firm industrial contracts the 'public service' obligation which now protects households. Suppliers would be free to meet this obligation as best they could – probably mainly by storage.

Imports

The Commission, and many politicians in Europe, are attracted to the catchphrase of reducing the so-called dependence on imports. From a strategic point of view it seems reasonable to count Norway as part of Europe (the EU documents never do). It is inconceivable that Norway would adopt an export policy which discriminated against the EU. For the European Economic Area (which includes Norway), imports supply 46 percent of energy consumption, 66 percent of oil consumption and 41 percent of gas consumption. Does this matter, as the EU policy makers seem to think?

Energy trade, like all trade, is driven by economic benefits. About 60 percent of world oil consumption is supplied by imports; almost every country either exports or imports oil. The benefits of this trade are very large. Policies which deny these benefits by aiming at 'energy independence' are unlikely to be adopted or, if adopted, are likely to be abandoned, like Nixon's 'Project Independence'.

The second point is that the international oil trade is almost perfectly structured to maximise security through diversity. Crude oils are close substitutes. They are transported relatively cheaply, mainly by sea. There are active commodity markets in New York (Nymex) and London (IPE) for benchmark crude oil and oil products. With small variations for quality and location, there is a world price for crude oil. Trade in crude oil is free of customs tariffs and import or export quotas (the OPEC quotas are on production). One consequence of the open oil market is that price signals allocate oil very quickly from where it is available to where it is scarce. 'Access to oil' today is a matter of paying for it.

The other consequence is that bilateral deals don't have much security value. It is the total supply of oil to the international market that matters for consumers (and the total demand to producers). If Russian oil exporters chose to sell all their seaborne exports of oil to the USA, they could be replaced in Europe by the oil which would be displaced from the USA.

The two keys to the security of oil supply are therefore maintaining the openness of the market and maintaining investment in new supply in the countries where the resources are. Access to these profitable investment projects is interesting to oil companies, but their interests should not be confused with the interests of oil consumers.

"The Commission, and many politicians in Europe, are attracted to the catchphrase of reducing the so-called dependence on imports"

Gas is different: the markets in pipeline gas are regional, often bilateral. Exporters and importers who are linked by pipeline have few alternatives. Russia's gas exports are totally dependent on the pipelines. Russia supplies about 20 percent of European gas consumption, but Europe provides 100 percent of the market for Russian exports outside the former Soviet space. Russia has an interest in diversifying its markets incrementally, but developing new infrastructure for alternative markets will require large investments and will take time. Europe, with a developing pipeline grid and with more LNG import terminals, is in a more flexible position, though it needs the full liberalisation of the internal market to take advantage of this.

Energy and Political Relations

There remains the question of whether oil or gas trade can be used for political purposes. The answer is 'seldom, and only as part of a larger engagement'. In the case of oil, any bilateral diversion of trade is likely to have limited effect because of the availability of strategic stocks in the OECD countries and the ability to switch trade from one country to another. The more serious threats are to exporters: UN or US sanctions apply to Iran, the Sudan and Burma and have applied to Iraq and Libya. Pipeline gas is rather different, but in most cases the economic importance of the trade to the exporters is a long-term protection for the importers. An exception might be Canada, where gas exports to the USA are small in relation to the economy; but is Canada likely to sanction the USA as part of some wider political confrontation?

This I think is the final key to understanding the role of energy trade in national security: the context is critical. As between Russia, the Ukraine, and Turkmenistan, energy trade is very important to the smaller countries and Russia has large political agendas with all of them. One has to ask what the political conditions would have to be for Russia to use energy supplies to Europe as part of a general confrontation.

Of course, energy will be an important part of EU–Russian relationships, in which energy is not the only bargaining counter. The Energy Charter Treaty and Transit Protocol were written on the narrow basis of energy trade and investment. It was the wider consideration of Russia's accession to the WTO that brought about some concessions on the pricing of gas within Russia. There are wider considerations about the future position of the Ukraine that will inevitably colour its availability as a transit route for Russian exports to Europe. Is energy more likely to follow, rather than lead in this engagement?

Energy trade is not the only element in the EU's economic and political relationship with other neighbouring countries. The EU is negotiating a free trade area with Algeria and

has established a 'European Energy Community' to extend the electricity and gas directive to the countries in south-east Europe. According to a Communication of 15 May 2006, the Commission appears to think that the same approach will work with the Maghreb and other Mediterranean countries of the Barcelona process and eventually with Russia itself, creating an internal market of 35 countries. However, in each case there are other important issues: migration, co-operation on terrorism and illegal money flows, non-energy trade and investment, and approaches to issues of common (but divergent) political interests in the Middle East.

Summary

Energy security includes reliability of supply to consumers. In electricity, more capacity is needed and the new investments require a fuel choice influenced by uncertain future government and EU policies on fuel mix, nuclear energy, mandates on renewables and the price of carbon.

Security of fuel supply needs careful analysis. Energy trade has great economic benefits. The risk of disruptions to oil supply can be managed by flexible open markets (such as the international oil market, and strategic stocks, such as exist for oil). Similar mechanisms are not in place for gas.

Bilateral deals have no function in securing oil supplies: in the case of pipeline gas, the dependence of exporters such as Russia is probably greater than that of the EU.

Oil and gas trade and investment may be an important part of general political and commercial relationships of the EU, especially with Russia, but the conditions are such that they are unlikely to dominate the broader engagements.

Tera Allas on energy security of supply in the UK: the way forward

In July 2006, the UK government published its review of energy policy (DTI, *The Energy Challenge*), describing the energy issues facing the country and announcing a set of measures to address these. Among the most difficult energy concerns is tackling global CO_2 emissions (see Box 1). But the next 10–20 years will also bring security of supply challenges, with increased gas import dependence and a need for major investments in our electricity infrastructure. Fortunately, many of the measures aimed at reducing CO_2 emissions – such as increased use of renewable fuels or improved energy efficiency – can also contribute to security of supply. However, these may not be enough to ensure the high energy reliability that is fundamental

Box 1: Climate change requires action both internationally and domestically

Among our toughest challenges is that of climate change: without the extensive set of policies announced in the Energy Review, we would be far from reaching our target of reducing emissions by 60% from 1990 levels by 2050. And we are not alone: the IEA projects that, on current trends, global CO_2 emissions will increase by 50% by 2030, with emissions from OECD countries increasing by 20%. So this is not a problem the UK can solve on its own. We therefore have to continue to show strong leadership in developing global climate change policy; and we have to make progress domestically to prepare for a potentially carbon-constrained future. In July, we highlighted the following key policy directions for tackling our CO_2 emissions:

Policy direction	Examples of measures
Maintain commitment to international CO_2 reductions	• Establish Office of Climate Change • Amend international legal framework and boost co-operation for CCS
Strengthen the EU Emissions Trading Scheme	• Refine and influence policy for EU ETS post-2012 • Promote inclusion of surface transport and aviation in EU ETS • Keep option open to further strengthen EU ETS/CO_2 price signals
Enhance energy efficiency across the economy	• Develop and implement energy efficiency standards • Improve metering, billing and information on consumption • Extend and refine existing supplier energy efficiency commitments
Lower barriers and strengthen incentives for low-carbon supplies	• Lower planning barriers to distributed energy, renewables and nuclear • Consult on policy framework for new nuclear build • Review incentives and barriers to distributed generation • Enhance incentives through changes to Renewables Obligation • Increase Renewable Transport Fuel Obligation to 5% after 2010/11 • Implement proposals towards carbon-neutral Government

to the functioning of our modern economy.

Box 2 summarises the security of supply policies announced in July. We remain committed to a market-based approach – where suppliers have a sharp commercial incentive to ensure energy is available for their customers when needed – as the most cost-efficient way of delivering security of supply. It has certainly delivered high levels of security to date. However, there is uncertainty about how this model might work in the future, as the energy environment shifts. Therefore, the government is implementing facilitative measures to maximise the likelihood that markets deliver appropriate levels of security of supply in future decades.

1. A Market-based Framework Can Deliver Security of Supply

There is a widely held misconception that the UK government has somehow given up responsibility for security of supply and that it merely hopes that market forces – in the form of price signals – deliver the goods. First of all, even if it was fully reliant on market forces, there are good reasons to believe that they would indeed deliver quite a lot. They have in the past: a wave of new power plants were constructed in the 1990s; owners of 21 GW of old coal-fired plant will soon have fitted it with Flue Gas Desulphurisation that will prolong its running life; companies operating in the UK North Sea spent £5 billion on exploration and development in 2005 alone; and roughly £10 billion is being invested in new gas import pipelines, LNG terminals and storage facilities, and onshore pipelines to support these investments.

More importantly, the incentives facing and hence the actions of energy producers and suppliers are not a coincidence but a result of our regulatory framework and meticulous market design. This is where the government and Ofgem have ensured that residential gas customers are protected against physical supply interruptions, that transmission and distribution companies face financial penalties for poor reliability, that suppliers or shippers 'short' of gas or electricity internalise the full costs of that shortage, and so on. It is not that private sector companies provide energy security from 'the goodness of their hearts' – it is because they have a strong profit-motive for doing so.

As a result, the current level of security of supply enjoyed by UK energy consumers is extremely high. In 2005, Oxera estimated that the likelihood of electricity supply not meeting demand (due to lack of generation availability) was essentially zero; even at capacity margins more than 75 percent below current levels, the probability of a material shortfall was 0.002 percent (10 GWh of annual demand, or the amount of supply lost each year due to distribution network failures). For gas, Ilex's modelling of the UK's supply/demand balance in 2006 suggested a probability-weighted 'gap' between demand and supply (otherwise known as 'expected energy unserved') of 0.3 percent of annual demand – and this in a year that is one of the tightest in the history of our gas market. Markets can and do deliver secure energy supplies. How this worked in winter 2005/6 is shown in Box 3.

2. But Markets are not Perfect and the Environment is Changing

It is fair to say that, while our framework has delivered security in the past, this is not a guarantee that it is necessarily robust going forward. In some ways this is inevitable: no one – including the government – can ensure 100 percent certainty. Markets,

Box 2: Security of supply will be delivered by a strengthened market-based framework

Market participants – rather than the Government or Ofgem – should have the knowledge and incentives to determine what the appropriate level of security of supply is and how this can be delivered in the most cost-effective manner. However, there may be obstacles – such as anti-competitive behaviour, regulatory barriers, lack of transparency, geopolitical tensions – that stand in the way of timely investment or effective trading. Our proposals in July, summarised below, were aimed at minimising these barriers:

Policy direction	Impact on security of supply
International strategy to promote open markets and contingency arrangements	• More investment in producing and transit countries • More stability in production and exports • Global ability to withstand geopolitical energy shocks
Measures to slow down production decline from the UK Continental Shelf	• More investment in exploration, development and production • Better utilisation of existing infrastructure
Reform of planning system for large-scale energy infrastructure	• Reduction in regulatory uncertainty vis-à-vis gas and electricity facilities • Reduction in lead-times in permitting and building new infrastructure
Consultation on framework for gas security of supply	• Potential measures to further ensure appropriate market outcomes
Enhanced forward-looking analysis and information on security of supply	• Objective information to help companies form expectations of future • Time for markets and Government to react to mitigate any risks
Clarification of policy position on renewables and nuclear	• Lower uncertainty for all electricity generation investment • Lower import-dependency of low-carbon power generation technologies

Box 3: How the gas market delivered security of supply in winter 2005/6

The supply/demand balance in the UK gas market in winter of 2005/6 was one of the tightest we have ever experienced. This was exacerbated by a number of discrete events: a cold spell early on, which depleted storage stocks; cold weather and market practices on the Continent limiting flows through the gas Interconnector from Belgium; and an incident at the Rough storage facility in February, forcing it off-line for the rest of the winter.

The main effect of these factors was on prices. As fears about the sufficiency of gas stocks emerged in November, forward prices for the rest of the winter increased dramatically. It then became more profitable for owners of stored gas to hold onto it or sell it forward into the latter part of the winter. The reduced storage flows put pressure on spot prices, increasing them to a level sufficient to help supply and demand balance on the day. Companies short of gas in the UK looked for ways to import more from the Continent or elsewhere. High prices incentivised power stations to find ways to run on alternative fuels, and a number of industrial facilities switched to using distillate back-up. A handful of energy-intensive companies reduced or stopped production, as gas prices became prohibitively high.

Were prices irrationally high? From an economic point of view, the answer is no. Modelling of the UK gas market indicates that, for the vast majority of days, prices matched very closely the marginal costs of supply and the marginal willingness of customers to pay. Overall, prices had to rise to an average level high enough to curb demand – and this level happened to be at around 50-80p/therm, the average cost of running on alternative fuels such as coal.

In the event, the UK gas market did not actually experience a physical shortfall in gas supplies. Prices were uncomfortably high and volatile but the impact of this was far less detrimental than involuntary interruptions. For example, work conducted by Global Insight and Ilex suggests that the economic loss from high and volatile prices while the market is still operating is perhaps in the region of 50-200p/therm; while the costs to the economy of involuntary interruptions could be more like 200-3000p/therm, with an average of 1200p/therm.

Had the Government or Ofgem intervened somehow to 'calm' prices, there would not have been the incentive for companies to look for additional supplies or for customers to reduce demand. The most likely outcome would have been a gas emergency, with involuntary interruptions to large users' gas supply. Moreover, and probably more damagingly, this would have dampened the enthusiasm of those working hard to bring gas into the UK for the following winter and beyond. Such intervention with market signals could have jeopardised the investment we need for our future security of supply.

comprising many different participants with different abilities to react quickly, are likely to provide a fair degree of diversity and flexibility to manage these risks. But the government also needs to review its framework to ensure it is fit-for-purpose in the longer run.

The issues potentially weakening our future energy security fall broadly into three (interrelated) categories: geopolitical or global energy risks, the domestic investment challenge, and possible market failures. Indeed, the impact of these, as illustrated by modelling work by Ilex and Redpoint, could be to increase materially the possibility of involuntary interruptions (or high and volatile prices) in the period between 2010 and 2020 in both electricity and gas. While there is a lot of uncertainty around these projections, and they depend on a large number of assumptions, levels of 'expected energy unserved' by 2020 could increase from essentially zero to around 0.15 percent and 0.025 percent of annual demand in gas and electricity, respectively. (For a more detailed discussion of how energy security can be measured quantitatively, see DTI, The effectiveness of current gas security of supply arrangements, on the DTI website.)

Recent events in global energy markets – ranging from the situation in the Middle East and Nigeria to Russia's behaviour in relation to Ukraine – have highlighted the geopolitical nature of energy. Fears about terrorism or major incidents have raised questions about the resilience of energy infrastructure worldwide. And lower-than-expected gas flows through the Interconnector last winter have drawn attention to the need to look beyond our shores to understand security of supply. In some ways, this is nothing new. However, given that by 2020 the UK is projected to be a net importer of around **80 percent** of its natural gas consumption, the importance of stable and reliable supplies from abroad will be amplified. Yet, these risks need to be considered in the context of factors that help to mitigate them.

Firstly, by and large, it is very much in the producing countries' interest to gain and maintain a reputation as a reliable supplier; anything else would likely result in a reduction in their oil and gas export revenues, on which many of these economies rely heavily. Secondly, as far as the UK is concerned, we are on a path to having one of the most diversified gas supply systems in the world. For example, Woodmac projects that Norway – the largest single import source to the UK – in 2020 will only account for around 20 percent of our supplies, with the rest coming from a large number of different countries as Liquefied Natural Gas or via pipeline. Thirdly, UK companies with large gas purchasing portfolios recognise these risks and are implementing strategies to remain robust against any shocks.

Perhaps a more material question is whether private sector companies will invest sufficiently and in time to meet the huge domestic requirement for new infrastructure in both power and gas in the next decade or two. Under normal circumstances, expectations of future market tightness and hence high and volatile prices (or price differentials between different regional markets) should feed into investment

decisions, thus balancing supply and demand. However, these may not be normal circumstances.

In electricity, our system is facing a major one-off event when 8 GW (over 10 percent of current capacity) of old coal-fired plant will have to close by the end of 2015 due to environmental restrictions and about 6 GW of nuclear plant is scheduled to close between now and 2014. This could create a 'cliff-edge' in generating capacity if there are financial, regulatory, management or supply chain constraints in building a number of new power stations in a short period of time. In gas, while the current wave of investment should provide a comfortable level of spare capacity till 2015 or so, last winter's experience illustrates the risk that new infrastructure may not always be perfectly timed. This could be due to regulatory barriers, such as planning, or imperfect foresight on behalf of companies.

"There is a widely held misconception that the UK government has somehow given up responsibility for security of supply"

Finally, it could be that there are genuine market failures, resulting in a sub-optimal level of security of supply. If companies, for whatever reason, don't fully appreciate the costs of rare but possible high-impact events (such as a very severe winter), they may not insure against such risks. If there are significant entry barriers, it may be in incumbents' interest to delay investment to enjoy high prices. If investment is very lumpy, the economics of new capacity – which when commissioned could result in lower prices across a company's whole portfolio of assets – may not be compelling. And if there are economy-wide benefits of energy security that private customers (or suppliers acting on their behalf) are not willing to pay for, a market may deliver a lower-than-optimal level.

It is impossible to prove – ex ante – whether such market failures will present themselves and whether the impact will be material. As demonstrated above, they certainly have not jeopardised our physical energy security to date. (Whether high and volatile prices constitute a failure in terms of security of supply is outside the scope of this article. A lot would depend on *why* prices were high and volatile; what, if any, overall welfare impacts that implied; and what, if anything, prevented market participants exposed to those prices from acting to mitigate them – e.g., through long-term contracts or investment in storage or alternative sources of supply). Given that the risks don't seem to appear to increase until well into the future (in the period between 2010 and 2020), a potentially pragmatic policy response could have been 'if it ain't broke, don't fix it'. Yet, it would not be prudent to leave it at that.

3. The New Measures Will Help the Market Framework Deliver further

Therefore, the government is taking a number of actions (such as removing planning barriers to investment) which cost relatively little and should help the market function more effectively (see Box 2). We are consulting on the current gas security of supply framework, to test its robustness for the future. And we will build on the Joint Energy Security of Supply (JESS) working group to provide enhanced analysis of future energy supply and demand scenarios and risks facing the UK market, supplemented by an informed, evidence-based debate around these issues. This way, all market participants will have time to identify emerging threats and opportunities and to respond to them in the most appropriate way.

Peter Odell assesses public/private partnerships on the UKCS

The DTI's Energy Review Consultation Document, *The Energy Challenge*, claimed that recent government policies had helped the UK to make the most of its indigenous resources of oil and gas. This assertion is not, however, confirmed by the dramatic fall in oil production since 1999 at a rate unparalleled in the global upstream industry – except for production declines caused by political and/or military actions (e.g. the Biafra war in Nigeria in 1979, the 1991 counterrevolution in the USSR and the 2003 invasion of Iraq). UK oil production is now only just over 50 percent of its 1999 level, not because reserves are running out, but as the result of unsatisfactory conditions for their exploitation and the inadequacy of government policies to stimulate production. For the same reasons, natural gas output has also fallen sharply – by over 30 percent since 2000.

Now, even if the government's hopes for 'a sustained development for a better future on the UKCS', as expressed in the Energy Review Report, prove to be achievable under the present set-up for the exploration and exploitation of the country's reserves and resources, then little more than 40 percent (1.65 million b/d oil equivalent) of the UK's hydrocarbons' demand in 2020 would be met from indigenous production. Imports of some 2.5 million b/d oil equivalent even at an average price of $30 per barrel – under half the current price – would create a charge on the balance of trade of some £28,000 million (in 2006 £s).

But 'sustained investment' in the UKCS, with its much higher finding costs compared with those in the Dutch and Norwegian offshore areas and somewhat higher average development costs, is likely to be undermined by its relative unattractiveness. Moreover, recent increases

(in 2002 and 2005) in the severity of the UK taxes on most of the oil and gas producing companies have further exacerbated their disincentives to invest in UKCS upstream activities. These adverse characteristics of the attractiveness of the UKCS for major upstream oil and gas companies – whose investment decisions are generally rank-ordered internationally – have been mitigated over the past two to three years by the off-setting impact of the very high prices of oil and gas. But these companies' long-term investment decisions are generally taken in the expectation of much lower real prices (of the order of $30/barrel oil equivalent in 2006 $s). A return to this lower level of energy prices would make the UKCS a lowly-ranked contender for exploration and development investments.

"the present exclusively private sector upstream oil and gas industry is inadequate"

In these contexts the Energy Review Report's ability to specify only one 'advance' since 2003 in the UK's role as a globally-significant hydrocarbons producer, appears to indicate a gross misunderstanding of the prospects for indigenous oil and gas production. Moreover, this sole 'advance' which is specified in the Report, viz. 'more interest in the 2005 and 2006 licensing rounds for North Sea oil and gas exploration than in any other round since 1964,' is in reality of relatively little importance. Licence purchases are not costly and do not inevitably lead to high levels of investment in exploration activities, let alone to new field developments. It is worthy of note that only 44 percent of the 54 'promote' licences issued in 2003 had, by the end of 2005, 'secured financing to press on with actual exploration' (*Offshore*, December 2005, p.22).

These adverse conditions and prospects for the UK's hydrocarbons prospects could, however, be reversed by a fundamental reshaping of the structure of the country's offshore oil and gas industry, thereby achieving the Report's declared objective 'of maximising the UK's oil and gas resources'. This necessitates, *first*, strong incentives to enhance production from the 20 or more million barrels of oil equivalent which the DTI estimates remain to be produced over the medium term from already discovered oil and gas fields, and from the prospect in other already mapped areas of the UKCS; and, *second*, a concurrent much expanded exploitation effort all across the UKCS so as to access additional large volumes of oil and gas, whereby production in the second decade of the century could be maintained upwards of 2.5 to 3.0 million b/d of oil equivalent.

In order to achieve the objectives set out above, the present exclusively private sector upstream oil and gas industry is inadequate. The UK necessarily has to compete with much of the rest of the world in order to secure an adequate continuing flow of capital for offshore exploration and exploitation by all the companies which operate internationally. In taking decisions on where to invest, such companies seek a minimum pre-tax rate of return of 20 percent. In this context, high finding and development costs as well as corporate taxation at 50 percent of the profits earned is hardly likely to provide much by way of incentive for new exploration ventures. Thus, even in the booming prospective investment climate to 2010 for the international oil and gas upstream offshore industry, there can only be low expectations of the UKCS' ability to attract great interest in the opportunities it offers for new oil and gas developments. The apparently successful take-up of new licences offered by the government in 2005 and 2006 must, instead, be interpreted as actions by a set of companies anxious to establish fall-back positions, should they not be able to secure adequate acreage for exploration elsewhere in the world; and/or in the event of oil and gas prices moving up towards $100 per barrel oil equivalent.

Almost all oil and/or gas-rich countries in the world (outside North America) have already recognised that their successes in the search for on-going indigenous exploration and exploitation activities necessitate public/private partnerships (PPPs). Only in this way can adequate levels of investments be jointly achieved, with the countries themselves satisfied by an acceptable 5–10 percent rate of return on their investments. Such relatively low public sector rates of return on oil and gas exploitation serve to ensure that the oil and gas fields produced by joint public/private ventures can be more intensively and extensively developed, so generating more oil and/or more gas production more quickly than would be the case with a private company-only project. At the same time, the participating companies' rates of return on such joint ventures in hydrocarbon developments can be enhanced to an acceptable level, with no royalties or tax complications which might otherwise undermine the companies' returns on their investments. The outcome is a win/win situation for both parties.

"successes in the search for on-going indigenous exploration and exploitation activities necessitate public/private partnerships"

The introduction of PPPs ought now to become the basis on which the very-much needed further exploitation of the UKCS can be achieved. This involves switching from a system which relies on intermittent allocations of concessions on which the successful companies can more or less proceed at the speed they choose – as and when investment funds become available and in competition with alternative investment opportunities open to them – to one in which there are ongoing joint venture developments. The latter are fundamentally different for both parties – viz. government and companies. On the one hand, the

government would have to establish a state entity (a Strategic Offshore Hydrocarbons' Authority – akin to Norway's PETORO) with the responsibility for creating continually available opportunities for exploration for hydrocarbons across the whole of the UKCS (except for blocks already licensed). From these opportunities, companies could at any time select areas they wished to explore, based on their knowledge of the hydrocarbons potential. The Strategic Authority, in turn, would be required at all times to consider such requests by any reputable company in order to determine, as a matter of urgency, the conditions and terms on which exploration could take place.

"the low-cost state investments will enhance the field's ultimate percentage of recoverable oil and/or gas"

Once a company's initial exploratory work confirms the existence of an oil and/or a gas field with production potential, then a PPP can be negotiated between it and the Strategic Offshore Hydrocarbons' Authority. Negotiations need not be protracted, once the two essential and intimately related elements of the PPP have been agreed:

First, determination of the maximum possible production potential of the field(s) within the knowledge that the low-cost state investments will enhance the field's ultimate percentage of recoverable oil and/or gas, and also help determine the associated optimal production curve;

Second, the establishment of the parameters which determine the shape of the rising cost-curve for increasing recovery and the anticipated rate of depletion. These data will indicate the proportions of the required investments from the private and public interests respectively. In these calculations the latter's share increases *pro rata* with the inevitably rising unit costs associated with higher recovery and production rates. Such technico-economic considerations create a basis for both the scale and the timing of the investment requirements, with the objective of determining a best-for-both parties' division of the production of oil and/or gas over the life of the field.

In the context of these radical procedures to boost a field's volume of recoverable reserves and for determining the shape of the production curve, it is important to be aware of the following considerations:

1. That the involvement of the state will not generate any material disadvantages for the company/companies involved in such PPPs. On the contrary, the companies involved are more likely to secure an enhanced return on their own reduced levels of investments in the enterprise. This is because it is the state's input of low-cost investments (with a 5–10 percent opportunity cost of capital) which generates both accelerated and enhanced production of the original oil and/or gas in place, compared with the results which would have arisen from decisions made exclusively by the company, given its requirements for a minimum 20 percent rate of return on its investments.
2. That the involvement of the state in the development of new fields will most likely be essentially financial only, as the operating company can be given a first-refusal opportunity to buy the state's share of the production at, say, a negotiated discount of 5–10 percent from market values as the mechanism whereby the company's initial costs of finding the field(s) can be offset. These guaranteed cash flows to the Strategic Offshore Hydrocarbons Authority will service the investments which it made on behalf of the nation.
3. That the public/private partnership for an intensified exploitation of the UKCS will eliminate the need for the special tax regimes which have hitherto been imposed on upstream oil and gas activities. Participating companies would have no more than the obligations of the UK's general corporate tax regime.
4. That the pro-active involvement by the state in upstream oil and gas developments will be highly positive for the UK's economy in several ways; first, from the public's expectation of a return on the investments made by the state on its behalf, generated by the revenue flows from the sale by the Strategic Offshore Authority of the oil and/or gas which the PPP has determined shall flow to the state; second, by the enhanced opportunities created for British companies involved in supplying equipment, goods and services to the offshore oil and gas industry; third, to the reversal of the present decline in oil and gas' contribution to the country's balance-of-trade; and, fourth, to securing 'affordable (and secure) energy for the long term', so fulfilling an important part of the 'Energy Challenge' to which the DTI's Energy Report draws our attention.

Olivier Appert provides an overview of French energy policy

For almost one century, energy has been a key concern for French governments. Just remember the letter sent by Clemenceau, the French Prime Minister, to the US President Wilson asking for supplies of oil during the battle of Verdun in 1917: 'a drop of oil

is worth a drop of blood'. After the First World War, a bunch of political measures were taken in order to ensure government control over the energy sector. This policy has been actively pursued since the Second World War by subsequent governments.

Historical Background

France is very poor in fossil energy resources. Coal, oil and gas production has always been limited. France relies heavily on imports of fossil and nuclear fuels and the energy trade deficit represented more than 38 G€in 2005.

"French regulation has changed profoundly in order to comply with the European directives on market reform"

For many years, French governments intervened directly in the energy sector through state-owned companies. As a result, the French energy system has been integrated vertically with national champions such as EdF, GdF or CdF for electricity, gas or coal, or AREVA for nuclear fuel. TOTAL was created by merging different oil and gas companies, either partially or totally state owned. Energy policy favoured security of supply, economic competitiveness with a strong social dimension. This system appeared efficient and robust and was flexible enough when it was necessary to engage in a profound restructuring after the oil shocks of the 1970s.In addition, it has been necessary to take into account new dimensions such as environmental concerns, both local and global, or the deregulation of the electricity and gas sectors driven among others by the EU Commission. At the same time, the government's share in most of the energy companies has been reduced by listing on the stock market EdF, GdF and TOTAL which is now totally privatised. High oil prices are currently renewing concerns over energy security.

Legal Framework

Many public debates have been launched in France on energy issues. The main trends in French energy policy have been established recently by the Energy Law of 13 July 2005. Four main objectives are pursued:

- To promote energy efficiency through different policies and measures, such as market instruments, regulations or tax credits.
- To diversify energy supplies. This will be achieved by increasing renewable energy. As France has kept the nuclear option open – which is a major supplier of electricity (78 percent in 2004) – a new nuclear plant will be built in Flamanville. This plant is of a new type (European Pressurised Reactor – EPR) and will become operational in 2012.
- To develop technological research in the energy sector in order to prepare for long-term challenges. R&D programmes have been launched on bio-energy, fuel cells, clean cars, efficient buildings, solar energy, CO_2 capture and storage, generation 4 nuclear plants. Implementation of this policy will be facilitated through the new public agencies which have been created: National Research Agency (ANR) for R&D and Industrial Innovation Agency (AII) for industrial development.
- To increase transport and storage facilities in order to ensure the reliability of the electricity and gas supplies and to improve French energy security.

Ambitious targets have been set up:

- To reduce, by a factor of 4, CO_2 emissions in 2050;
- To improve final energy intensity by at least 2 percent per annum up to 2015, and 2.5 percent between 2015 and 2030;
- To produce 10 percent of energy needs from renewable energy in 2010;
- To increase the biofuel market share up to 5.75 percent in 2010.

French energy policy has to be implemented within the global framework of the European Union. In January 2006 France issued a Memorandum on 'European Energy Policy in the Perspective of Sustainable Development'. Most of the French proposals have been included in the green paper of the EU Commission released on 8 March 2006.

Some Key Issues

Within this framework, some key topical issues may be emphasised: market reform, public ownership of utilities, power generation investments, energy efficiency and renewable energies, new energy technologies.

Market Reform

For the last few years, French regulation has changed profoundly in order to comply with the European directives on market reform.

An independent regulator has been set up: Commission de Régulation de l'Energie (CRE). Special emphasis has been put on the independence of this body towards the French government and companies operating in France. It has a wide range of administrative and economic responsibilities.

"French energy policy is prioritising energy efficiency and renewable energies"

Transmission activities have been unbundled from previous electricity and gas utilities. These activities are managed by autonomous entities: Réseau de Transmission de l'Electricité (RTE) for electricity, and for gas both Réseau de Transmission de Gaz (RTG) and Total Infrastructures Gaz France (TIGF). These entities are subsidiaries of previous utilities, but their independence is ensured by the energy regulator. The same applies for distribution.

Public Ownership of Utilities

A dramatic change has happened in

the last few years within the French energy sector. Former monopolies for electricity and gas, EdF and GdF have been listed on the stock market. Another step forward will take place with the merger of GdF and SUEZ which may be finalised by the end of the year.

Even if these companies are only partly privatised, this creates a completely new framework for the French energy sector with new types of relationships between government, utilities and final consumers.

"Deregulated markets by themselves do not ensure that adequate long-term investments will be made"

Power Generation Investments

Deregulated markets by themselves do not ensure that adequate long-term investments will be made: this is specifically the case for electricity. For this reason French regulation has set up a process in order to identify investments that are needed to ensure electricity security. This process, called PPI, demonstrates how the French authorities view the future of power generation. It takes into account security issues as well as environmental and economic concerns. In addition, it considers issues related to the geographical imbalance between production and consumption.

The latest report was presented to the French Parliament in mid 2006. It states the major objectives of the development of power generation up to 2015, focusing particularly on renewable energy and nuclear as well as the future role of coal and gas.

Energy Efficiency and Renewable Energies.

In the context of the climate change challenge, French energy policy is prioritising energy efficiency and renewable energies.

Many policies and measures have been put in place, such as tax credit or reduced VAT rates for energy efficiency or the introduction of renewables in buildings and co-generation, and for alternative cars; as well as new energy regulations for new buildings. A new market instrument known as a 'white certificate' has been put in place in order to promote energy savings to the final consumers.

In order to increase the market share of renewable energy, calls for tenders have been launched for new wind farms, biofuels and bio-electricity facilities. As far as biofuels are concerned, the French government is strongly committed to reach the targets set up in the European directive: its objective is also to ensure that by 2010 cars consuming transport fuel with a high biofuel content would be made available to everyone.

New Energy Technologies

In addition to R&D activities on nuclear energy (generation IV, waste disposal and so on) a comprehensive R&D strategy has been set up in the field of non nuclear energy. There is a special focus on energy efficiency in buildings, solar energy, biofuels, hydrogen, CO_2 capture and storage, as well as clean transport. Different R&D programmes have been launched in order to promote cooperative projects with industry, research centres and academia.

* * * *

Energy issues are returning to the forefront of the political concerns of the governments of consuming countries. Because of high oil prices, and more generally energy prices, a new emphasis has been put on energy security. The policies and measures decided on by the French government, as well as those of most consuming countries, are also taking into account the challenge of climate change. Today, there is a clear synergy between energy and environment policy. Hopefully these integrated energy and environment policies will help to solve both challenges. This could be the case if the policies are implemented with continuity over the long term.

Energy in Flux

What the Shifting Dynamics of Energy Mean for the International Community

Joseph A. Stanislaw

Tectonic forces are roiling global energy markets. China and India have emerged simultaneously both as mighty consumers and shrewd market players – they represent the new factor of 'might and market' in global energy. Russia, meanwhile, is leading a wave of natural-resource nationalism, while asserting itself politically by leveraging its formidable market presence.

The critical mass of human capital is also migrating: as Western expertise ages and fades, the former Soviet states and Asia are filling the gap. For the wide variety of technologies ranging from crude oil to nuclear power to fuel cells, the centres of technology, application, know-how, and human capital are progressively developing outside the West.

But perhaps the most important change is transpiring almost without notice. The *geography* of energy is undergoing a radical shift. Whereas Saudi Arabia remains at the heart of production, the centre of gravity has already begun to stretch north and east – the Saudi-Caspian-Siberia-Canada (SCSC) axis will drive the 'energy of geopolitics' in the twenty-first century. The relative importance of oil and gas is also undergoing a quiet revolution: the old 'oil game' is becoming an 'oil and gas game', and will become more of a 'gas and oil game' before the next energy paradigm shift occurs.

In the midst of all these structural changes, the spike in energy prices over the past two years could catalyse a new era of market-driven innovation in alternative energy, conservation, sustainable development, and international cooperation. More than a generation has been lost during which the pursuit of these ideas has not been aggressive enough; we cannot afford to lose another.

Two generations of talent and technology are needed to wean the global economy from oil, gas, and coal. One way or another, alternative and renewable sources eventually will come to reign. The question is whether fossil fuels can be expended wisely as a bridge to this emergent world, or whether the transition will be a tumultuous one – making us nostalgic for the good old days of $60 oil.

If this opportunity slips away, the consequences could be dire. In the 1970s, the Arab oil embargo subverted price stability and sunk economic growth. That was bad enough. Now, however, by not heeding the hidden messages of $60+ oil, we place in jeopardy far more than economic growth: global political harmony, the environment, the possibility of catastrophic climate change, and the promise of sustainable development all lie in the balance together – *at the same time*. And our collective ability to meet the basic needs of all the world's people is at stake.

Complicating the prospects for international energy cooperation are the conflicting perspectives of the major powers on the democratic movement. How far will the push toward democracy, free trade, and globalisation progress given the aggressive competition for energy supplies that lies ahead? China and Russia have cast a wary eye on Washington's evangelical pro-democracy agenda. Meanwhile, the concentration of 'democracy projects' along the SCSC axis – from the Middle East through Central Asia – hides the potential for more danger. Nor have the now 'traditional' troubles in Arabia and Persia gone away: the Iranian nuclear threat, a de facto civil war in Iraq, the darkening shadow of extreme fundamentalism. And if all this were not sufficiently worrisome, Latin America, too, is in the grips of renewed nationalism and local activism.

The overriding challenge going forward is captured by a vastly expanded definition of 'energy security'. No longer does this simply mean security of supply. Energy security goes beyond this to encompass security in the political, environmental, infrastructure, and even terrorism senses, as well as the new concerns of sustainable development and climate change.

* * * *

In the race to arrive at this new energy era with the urgency demanded by the challenges we face – political, environmental, economic, and even social – the West is lagging behind other players who are proactively shaping the twenty-first century energy picture: China and India are roaming the world to secure resources; Japan is the standard-bearer of applying new energy technologies; and nuclear programmes are blossoming on several continents. Meanwhile, the Kyoto Protocol has keyed innovation in smart technologies, solar power, wind turbines, clean coal, biofuel, and other energy frontiers. Distributed energy solutions might soon reach the far corners of the earth, empowering local communities and finally delivering essential services to the billions living on just a few dollars a day.

Certainly Europe – with its emphasis on conservation, carbon trading, and relatively ambitious targets for new and renewable energy sourcing – is more forward-leaning than the United States. However, both need to embark on a far more ambitious course in a race against time: Their meandering stroll towards the new energy era must become a purposeful marathon.

For the world to arrive at this new era the USA and Europe will have to take the lead together in each going further than they have today. At the moment, mostly lip service is being paid to reshaping energy demand through regulation and conservation, and spurring innovation in supply by offering incentives to the market. In the USA, meanwhile, a dozen states are the vanguard of creative policymaking; but rather than being a boon, this tangle of energy regulations has complicated corporate investment and development. Without delay, Washington needs to establish the 'authorising force' to define a brave new world of energy innovation.

A similar patchwork quality is evident in the European Union, which needs to provide a better energy framework

in which each country can develop its own solutions. At the moment, Member States pursue individual strategies to secure the resources they need, but fail to leverage the Union's full market power. The European picture is further muddied by the divergent political postures that EU Member States have toward Russia, the continent's dominant supplier of natural gas. Nonetheless, several areas of real progress exist: Europe, for instance, has provided market pull to make it more likely that solar and wind will have a long-term future; it is at the vanguard of nuclear technology; and it is committed to implementing innovative market solutions such as carbon trading.

* * * *

Any effective solution in both the United States and Europe will have to push on the supply side while pulling from the demand side. For too long in the USA, new energy technologies and calls for increased efficiency have been dismissed as having too little potential, requiring too much time to implement, and costing too much. In effect, we were 'pushing on a string'.

To create the needed realignment, consensus must first be forged that new technologies are needed – not just in the developing world, but also in the wealthiest of countries. In addition, nations must acknowledge that tensions exist amongst them; they must then create some form of international cooperation around these crucial issues and establish the policies necessary to 'pull on the string' and move forward. The question Washington and the world's capitals should be asking is: What can we do to lessen the world's dependence on hydrocarbons while striving to realise these transformations?

On the new energy playing field, policy will set the boundaries, regulation will create the rules, government authorities will serve as the referees, and the market will determine prices, as well as the winners and losers in the game. In other words, we must allow a game to develop in which the markets will have the maximum play to determine which technologies succeed. The playing field must be set up in a way that allows carbon pricing to be a market force, thereby working toward carbon limitation and stabilisation. And a fundamental dynamic in all this is that while the rules will change over time, it is essential to forge agreement among the referees and the players regarding the game itself.

Put simply, failure to act will place both the developed and developing world at great risk of serious economic, political, environmental, and social crises as conventional energy supplies become more scarce and competition for them turns fierce. The world cannot afford to wait another thirty years.

US Environmental Policy in states vs. the States

David Fridley describes California's 'Global Warming Solutions Act' of 2006

On 27 September 2006, California Governor Arnold Schwarzenegger signed into law the first binding programme limiting greenhouse gas emissions in the United States. The law – Assembly Bill (AB) 32 – grew out of a multi-year effort of legislators, environmental groups, state businesses and the environmental justice community and establishes a framework for the creation of a comprehensive programme to limit state emissions of greenhouse gases across all sectors of the economy. The goal of the programme is to limit emissions in 2020 to the level they were in 1990, or about a 25 percent reduction from current levels. In this law, 'greenhouse gases' are defined to include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride, the same six gases as defined in the Kyoto Protocol.

Implementation will take place over several years through several stages, with full implementation starting in 2012. Detailed rule-making for the law will be the responsibility of the California Air Resources Board (CARB). Starting in 2006, AB32 set 31 December as the cut-off date for companies voluntarily reporting their emissions to the California Climate Action Registry to be grandfathered under that programme, making them exempt from any future substantial changes to their emissions reduction programmes as a result of new regulations from CARB. In addition, participating companies will get credit for their 'early action' under the Registry programme when specific emissions targets are set.

In 2007, CARB will publish a list of 'early action' measures for the reduction of greenhouse gases that can be implemented before 2010. These measures in turn will be formalised into regulations by 2010 and become enforceable on 1 January of that year. CARB is also required to incorporate the reporting standards protocols of the Climate Action Registry to the extent feasible and to issue their own set at the beginning of 2008. At the same time, the Board is required to report the level of emissions in 1990 and to approve it as the formal 2020 target.

By 1 January 2009, CARB is directed to develop a statewide 'scoping plan' indicating the maximum amount of emissions reductions that are technologically and economically feasible from specific sources or types of sources. This process will involve consultation with all other agencies with authority over greenhouse gas emissions (such as the Public Utilities Commission), public hearings, along with calculation of economic and non-economic costs and benefits from various measures. AB32 also establishes an Environmental Justice Advisory Committee and Economic and Technology Advancement

Advisory Committee to ensure that emissions of criteria pollutants and cumulative impacts be considered as reduction measures are evaluated, and to determine the best targets of state-supported investment in technology research, development and deployment to reduce greenhouse gas emissions.

"Of greatest concern is the impact of global warming on California's Sierra snow pack, the source of most of the state's summer water supply"

Finally, by 1 January 2011, CARB is required to publish implementing regulations to achieve the 2020 target, to go into effect one year later. The 2011 regulations must take into account the impact on public health and the economy, and specifically includes authority to use market-based mechanisms to achieve declining emissions limits. This includes a 'cap and trade' programme, which would establish a carbon market in California, but which must avoid the increase in emissions of other pollutants.

Industry and political concerns over the rigidity of reducing emissions to 1990 levels led to the inclusion of a 'safety valve' that allows the Governor to suspend the regulations for one year in the case of serious economic challenges or catastrophic events such as a major earthquake.

Although AB32 is far-reaching and impacts nearly every part of the California economy, including its extensive chemical, biotech, oil and gas, agricultural, and health care industries, two main sectors stand out as keys to the programme's success: transportation and power generation, which together account for nearly two-thirds of state emissions. Substantial progress in both areas is necessary to achieve the 2020 reduction targets. In the transportation sector, which accounts for 41 percent of California's emissions, California has been a national leader in the push to improve vehicle efficiency, promote cleaner fuels, and reduce emissions, but recent policies have encountered stiff resistance from the automotive industry and the Federal government. In 2002, California passed a law requiring the CARB to develop and enact regulations by 1 January 2005 to achieve the maximum possible reduction of greenhouse gas emissions from passenger cars and light trucks, including SUVs. These regulations, collectively reducing emissions by 22 percent by 2012 and 30 percent by 2016, have been adopted and take effect in 2009. In late 2004, however, the Alliance of Automobile Manufacturers and California dealers filed suit in Federal court challenging the regulations, arguing that carbon dioxide reductions were primarily an issue of improving fuel economy, and that the Federal government has sole authority to regulate fuel economy. The California attorney general requested the US District Court to dismiss the suit in September 2006, and a hearing on the matter will be held in early 2007. Failure to win the suit or to achieve its dismissal would significantly reduce the possibility of achieving the 2020 target.

In a separate action intended to counter the auto companies' suit against California's vehicle emissions reduction target, California's attorney general filed suit in September 2006 against the major automobile manufacturers – including Ford, Honda, Toyota, DaimlerChrysler, Nissan, and General Motors – claiming damages for the millions of tons of greenhouse gases that their products have emitted in California, citing billions of dollars in damages and seeking to hold the automakers liable for future damages. Of greatest concern is the impact of global warming on California's Sierra snow pack, the source of most of the state's summer water supply and vital to the agricultural sector, the largest in the country. The outcome of the suit is uncertain, although a similar suit against major utilities brought by eight states in 2004 was dismissed by a Federal court in 2005.

Power generation accounts for 22 percent of California's emissions, including those emissions generated out of state for electricity imports consumed in California. Here, California's successes to date in promoting renewables and hydropower will likely make future reductions more difficult compared to other parts of the country where coal forms the primary fuel for power generation. Currently, renewables, large hydro, and nuclear power provide 42 percent of California's in-state generation, with natural gas accounting for another 38 percent. The balance – coal-fired generation – is all from plants physically located out of state but in the California power control area. Imports, which provide 22 percent of California's power, are largely from the hydro-rich Pacific Northwest and the coal-dominated Southwest. AB32 will prohibit investor-owned utilities from purchasing power from out-of-state sources that do not meet the California emissions standards, effectively extending the impact of California's emissions cap to other states.

"The California Global Warming Solutions Act of 2006 is likely to set a precedent for adoption in other states"

Given the relatively low proportion of coal-fired generation in the state power mix, achieving the 2020 target depends heavily on the success of California's Renewable Portfolio Standard (RPS) regulations, which requires investor-owned utilities to generate at least 20 percent of their power from renewables in 2010, and 33 percent by 2020, up from the current 10 percent. Although the public heavily favours the expansion of renewable energy, the RPS itself establishes complex bureaucratic hurdles to its development. Mindful of the chaos in California's deregulated electricity market in 2000 and 2001, when a combination of capacity shortages and market manipulation by traders led to rolling blackouts and widespread

economic losses, California regulators now require developers and utilities to work with both the California Energy Commission and the Public Utilities Commission for approvals of any new renewable energy projects, resulting in substantial delays in implementation. As a result, California has added only 240 MW of new renewable energy capacity since 1999, compared to 2200 MW of new renewable energy capacity in Texas, which has overtaken California as the largest wind power producer in the country.

The California Global Warming Solutions Act of 2006 is likely to set a precedent for adoption in other states. Already, eleven other states and three cities have brought suit against the Environmental Protection Agency to force it to regulate carbon dioxide as a pollutant. The case has gone to the Supreme Court, which will hear arguments and decide on the case in late 2006. In the US Northeast, seven states have agreed to implement the Regional Greenhouse Gas Initiative (RGGI), establishing a cap-and-trade programme aimed at reducing utility emissions of carbon dioxide. In establishing its own regulations for implementation in 2012, California is required by AB32 to consider other national and international practices for greenhouse gas reduction, including voluntary programmes and the operations of other carbon trading schemes such as the European Trading Scheme (ETS) and the voluntary Chicago Carbon Climate Exchange. Linkages to these programmes would likely make California's own programme more robust by increasing the size of the potential market for carbon, although the law does not specifically require a cap-and-trade scheme. As the twelfth largest greenhouse gas emitter in the world, California's response to climate change will provide a foundation for the political consensus to emerge in the USA for a national response.

Benito Müller looks at the climate change initiative in New England and the North East

The North East, and particularly New England, has for some time been active in introducing state, regional and even trans-border climate change measures. As with other state-level and regional initiatives, the key motivation for these North-Eastern initiatives was the realisation that climate change is a real problem, and that the Federal administration has failed to show sufficient leadership to address it. This sentiment is shared not only in the North East but also on the West coast, particularly in California. Indeed, California Governor Arnold Schwarzenegger has very recently met with George Pataki, his New York counterpart (both Republicans) to discuss linking California's emission trading system with the efforts undertaken in the North East of the country. And although Schwarzenegger 'has not criticised [President] Bush by name, he has been vocal in his condemnation of the slow-moving federal response to climate change' according to a recent article in *The Financial Times*.

There are ten states in the region – six with a Republican and four with a Democratic Governor – that have adopted some form of mandatory greenhouse gas emission reduction measures. As listed in Table 1, eight of these states – representing 9 percent of 2001 US emissions – involve state-wide emission caps for different time horizons, caps that are stricter than the target of returning to 1990 levels by 2020 just adopted by California (6.7 percent of US emissions)

At least two of these measures deserve to be highlighted, namely the Climate Change Action Plan (CCAP) by the Conference of New England Governors and Eastern Canadian Premiers (NEG-ECP), and the Regional Greenhouse Gas Initiative (RGGI).

Climate Change Action Plan (CCAP)

The CCAP includes provisions for reducing energy demand through conservation measures (20 percent reduction by 2025) and it addresses emissions from the transport sector and the electricity sector (20 percent reduction of CO_2/MWh by 2025). It adopts the following regional goals:

- **Short-term Goal:** To reduce regional GHG emissions to 1990 emissions by 2010.
- **Mid-term Goal:** To reduce regional GHG emissions by at least 10 percent below 1990 emissions by 2020, and establish an iterative five-year process, commencing in 2005, to adjust the goals if necessary and set future emissions reduction goals.
- **Long-term Goal:** To reduce regional GHG emissions sufficiently

Table 1: North-Eastern States with Climate Change Regimes

	Admin.	*Share of 2001 US emissions*			*2010 Target (rel. 1990 level)*	*2020 Target (rel. 1990 level)*
New Jersey	Dem	2.1%		RGGI	-3.5%	
New York	Rep	3.7%		RGGI	-5.0%	
Connecticut	Rep	0.7%	CCAP	RGGI	0.0%	–10%
Maine	Dem	0.4%	CCAP	RGGI	0.0%	–10%
Massachusetts	Rep	1.4%	CCAP		0.0%	–10%
New Hampshire	Dem	0.3%	CCAP	RGGI	0.0%	–10%
Rhode Island	Rep	0.2%	CCAP		0.0%	–10%
Vermont	Rep	0.1%	CCAP		0.0%	–10%
Delaware	Dem	0.3%		RGGI		
Maryland	Rep	1.4%		RGGI (2007)		

to eliminate any dangerous threat to the climate; current science suggests this will require reductions of 75–85 percent below current levels.

In 2001, the NEG states (black bars in Figure 1) were on average 5 percent above their 1990 target level, although with large variations, ranging from Rhode Island with 30 percent above the target and Massachusetts 3 percent below, with the larger emitters (in terms of shares in total US emissions, see Figure 1) faring rather better than the smaller ones. New York and New Jersey who, although not part of the NEG, have also taken on 2010 targets below 1990 levels, in turn were 7 and 10 percent above their targets.

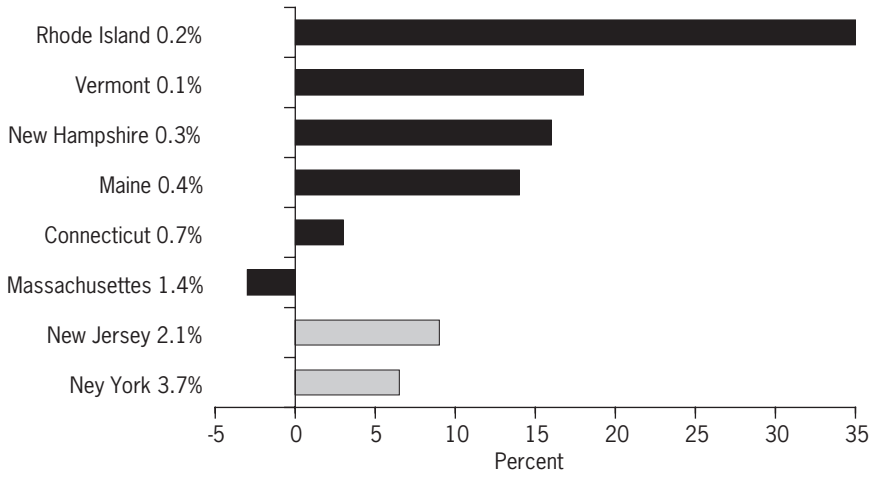
In total, the North Eastern state emission reduction targets, if achieved, would have meant a reduction of 21 $MtCO_2e$ from 2001 levels. Although only 0.3 percent of total US emissions at the time, as in the case of the Kyoto Protocol, one should not underestimate the signalling effects of such commitments and actions.

"the key motivation … was the realisation that climate change is a real problem, and that the Federal administration has failed to show sufficient leadership to address it"

Regional Greenhouse Gas Initiative (RGGI)

While the short-term goal of the 2001 CCAP is strikingly similar to the emission mitigation objective of the 1992 UN Framework Convention on Climate Change (namely to return CO_2 emissions of the rich industrialised countries to 1990 levels by 2000), the 2005 RGGI is a cap and trade regime which could be regarded as the region's answer to the 1997 Kyoto Protocol (although it might be wise not to say so, given the still prevailing Kyoto-phobia in large parts of the USA).

Figure 1: North Eastern States Compliance Status: Percentage Difference from 2010 Goals (per cent share of total US emissions listed in legend)



On 20 December 2005 the RGGI – the first mandatory US cap-and-trade programme for carbon dioxide – was announced by the governors of seven north-eastern states: Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, and Vermont.

The programme's trading sector covers electric generating units that have a nameplate capacity equal to or greater than 25 megawatts and burn more than 50 percent fossil fuel.

It aims to bring back emissions to approximately current levels over the period from 2009 to 2014, and it is expected that this involves on average a reduction of around 7 percent from 'business-as-usual'. Between 2015 and 2018 emissions will have to be reduced by a further 10 percent.

Like the Kyoto Protocol, the programme allows for project-based 'offset allowances' which are credits that can be generated outside the trading sector. Initially, a source will be permitted to cover up to 3.3 percent of its emissions with offsets – an amount that is approximately 50 percent of the projected average emission reduction obligation under the programme.

Offset allowances may be issued initially to verified reduction projects anywhere in the United States in the following areas:

- Natural gas, heating oil and propane energy efficiency;
- Landfill gas capture and combustion;
- Methane capture from animal operations;
- Forestation of non-forested land;
- Reductions of sulphur hexafluoride (SF6) emissions from electricity
- transmission and distribution equipment; and
- Reductions in fugitive emissions from natural gas transmission and distribution systems.

In case of prolonged periods of higher permit prices (>\$10/tCO_2), a number of safety valves are put into place. For one, the compliance period can be extended by up to three years, but more interestingly, there is the provision that after two years of such extensions, 'geographic scope will also be expanded to offsets from international trading programs', such as the Kyoto Protocol's Clean Development Mechanism. This means that RGGI contains the seed for 'internationalisation,' indeed for collaboration with the forthcoming Kyoto successor regime. As it is unlikely that any future mandatory Federal greenhouse gas reduction regime could ignore the architecture of RGGI, this seed is an important gesture and should be reciprocated by the international regime which is currently being renegotiated.

The latest news from the region is that on 6 April 2006, Maryland Governor Robert L. Ehrlich Jr. signed into law a bill which requires Maryland to join RGGI by 30 June 2007.

Crude Oil Pricing Formulas

Almost 21 years ago Pemex introduced spot-related formulas for determining the price of its crude oil exports. Other major players in the international oil market later adopted them and they continue to have a major influence on how oil prices are formed today. This might be a good time to remember the context in which they were originally developed, the objectives and constraints to which they responded and the role they played as part of the overall package of instruments of its commercial strategy. The recent dramatic structural changes and cyclical fluctuations in the level of prices, in price differentials and refining margins reflect shifting changes in fundamental market conditions and a redistribution of market power. At this juncture a full critical review of this pricing mechanism is warranted and could suggest possible adjustments to the formulas. However, an appraisal of the performance of the Mexican formulas is well beyond the scope of this brief memoir.

The government selling price regime was under growing stress after 1981 and in a clear state of disarray by the middle of 1985. Widespread price discounting was corroding the system. Substantial incremental production from Alaska, the North Sea, the USSR and Mexico had contributed to conditions of excess supply, given the contraction and changing structure of global oil demand. The burden of adjustment was imposed on OPEC member countries, particularly Saudi Arabia who had assumed the role of swing producer in order to protect prices and preserve the oil price regime. However, its position had become untenable. The Kingdom's production was curtailed from a sustained level of 10 mb/d in 1980–81 to 2.3 mb/d in August 1985. Official government prices had also become dysfunctional in Mexico. Export prices were slow to react to changing global and regional market conditions. Competitive price discounting was not a politically viable alternative. Ministerial discretion and governmental agreement in the setting of prices lagged behind Pemex's commercial recommendations. There were a number of episodes in which significant sales volumes were lost. The most serious one was in June of 1985 when crude oil exports almost halved with respect to January–May volumes. Since 1981 export price determination had become highly politicised. A Pemex CEO with presidential ambitions had been dismissed after what was seen as an excessive unilateral price reduction. This event had made ministers particularly risk averse to crude oil price adjustments.

Personal Commentary

Adrián Lajous

In September 1985, at the Oxford Energy Seminar, Sheikh Yamani announced that his country would cease to play the role of swing producer and suggested the introduction of net-back pricing. Five Mexicans headed by Mario Ramón Beteta, the CEO of Pemex, were there. Immediately after the seminar session the five of us went off to the Oxford Botanical Gardens. My colleague Pedro Haas and I argued that the Yamani intervention had been an implicit declaration of a price war and that Pemex was badly prepared for it. Unfortunately we were right on both accounts. Clearly we had to act swiftly and decisively. As Managing Director for International Marketing I proposed to Beteta the immediate formation of an internal working group that would be supported by external advisors. At my request Bernard Minkow, a Director at McKinsey and Co., mobilised a high-powered team to work for Pemex. I also sought the advice of Joe Roeber, a reputed oil industry consultant, and retained George Kahale, a New York lawyer then a junior partner at Curtis, Mallet-Prevost, Colt & Mosle. In this project, as in many other junctures in my professional life, Robert Mabro responded generously sharing with me his wisdom and deep knowledge of the industry.

Netback pricing turned out to be an infernal machine. The price collapse of 1986 was the result of the decision by Saudi Arabia and other OPEC members, to regain market share and to discipline producers who had been expanding production at their expense. In a short period of time the Kingdom's crude production recovered significantly. In the first quarter of 1986 production was 80 per cent higher than the previous August low and had almost doubled by the second quarter. OPEC as a whole had also recovered significantly. However, netback pricing was highly destabilising as customers had no interest in restraining the fall of prices given that they were effectively guaranteed a certain, and by no means ungenerous, margin. Under these conditions buyers were more interested in maximising throughput than in performing their traditional crude and product arbitrage function. Prices spiralled down for more than seven months until they bottomed out in July 1986. Most of the collapse took place during the first quarter of that year. Spot WTI fell from $26 a barrel at the beginning of 1986 to $10.25 at the end of March. The prices of Isthmus and Maya followed suit, dropping by more than 60 percent in the first seven months of the year. Also, the complexity and opacity of the price mechanism posed multiple problems. A long list of parameters and assumptions had to be negotiated, making it particularly difficult to assess the impact of specific changes on the level of prices. This lack of transparency opened opportunities for manipulation and corruption.

The Pemex team began to work immediately on three interrelated fronts: the design of the pricing mechanism, the development of a new standard term supply contract and the analytical infrastructure that would allow the monitoring and simulation of our customer's crude purchasing decisions. Timing was of the essence. In February 1986, during the annual Institute of Petroleum Week industry gatherings in London, Pemex would

meet with its customers. It was a good opportunity to present and discuss pricing formulas and propose a new draft contract. Pemex wanted a transparent, semi-automatic pricing mechanism, with very limited managerial discretion, that could be easily supervised by government agencies. Managerial intensity was to be kept to a minimum, given the scarcity of skilled human resources in our commercial area. Realised prices would be in the public domain and simply replicated by applying the relevant price formulas. Mexican crude oil prices should be directly related to other actively traded crudes and not to products, as was the case with netbacks. The pricing formulas were associated to term contracts. Spot transactions would only be allowed for trail cargoes and with term customers. Resale would not be permitted in order to inhibit the development of a secondary market. This ensured term buyers that all customers were to be treated in exactly the same manner. Under the new contracts price flexibility counterbalanced volumetric rigidity.

Formulas were developed for each one of the crude streams exported by Pemex to each key market it served. There were formulas for Isthmus crude, a 33° API sour crude similar to Arab Light and to WTS; for Maya, a 22° API, high sulphur and high metals content heavy crude; and, Olmec, an extra light stream with a high lubricant yield. The main markets were the US Gulf Coast, NW Europe, Japan and eventually the US West Coast. These markets were segregated through effective resale restrictions. The formula structure was kept simple. It included only two elements: a market tracking mechanism and a shift factor that allowed for minor adjustments in the level of pricing. For example, in the case of Isthmus crude for the Gulf Coast, the original tracking element comprised the spot prices of WTI, WTS and ANS, equally weighted, forming a synthetic crude whose gross product yield was very similar to that of Isthmus in a FCC refinery, the deemed marginal refining mode at the time. The shift factor was expressed as a constant that could be adjusted on a monthly basis. It captured quality differences and random variations under changing market conditions. It was the only discretionary element of a semi-automatic price-setting mechanism that directly linked Mexican crudes to the spot prices of traded crudes in the relevant markets where they were sold. Maya posed slightly more complex pricing issues as it was not a general purpose crude. Its tracking mechanism also included high sulphur No. 6 fuel oil. This synthetic mix obtained similar yields to those of Maya. However, the shift element had to be adjusted more often and by a relatively larger amount. European formulas were linked to Brent in a similar manner and the ones for the Far East to Oman and Dubai crude oil prices.

Initial customer and specialised media reactions to Pemex's innovative proposals were mixed, ranging from offensive and dismissive reflexes to considered, if cautious, responses. Their explicit underlying analytical logic was particularly useful in our negotiations with the majors. Market responsive pricing of short-haul crudes offered important advantages to US Gulf Coast refineries. Protracted contractual negotiations were never interrupted, while crude oil continued to flow at prices that were determined by the new formulas. Meanwhile, a fruitful but not always successful, Maya crude technical sales effort was deployed. One of the key outcomes of the new marketing strategy was the discernible improvement in the quality of our customer portfolio. However, success in the implementation of the new price formulas and term contracts was far from assured. There were particularly tense moments during the first half of 1986. At the end of March Mexican export volumes had not fully recovered and prices continued to collapse. On the home front, doubts were growing with respect to the course of action that was being pursued. By the summer some of my principals thought that we were losing the price war. In June, the average realised price of Maya was down to $7.63 a barrel. The government was facing serious fiscal and balance of payments issues that had been triggered by the oil shock. Tough strategies to restore the macroeconomic balance were being considered. I remember talking over the phone with Pedro Aspe, then the Under-Secretary of the Budget, who was in the waiting room of the IMF's Managing Director, as consultations were about to begin. I conveyed to him my concerns and misgivings after having just sold a cargo of Maya at $5.50 a barrel in Salina Cruz. Shortly after, the negotiations with the IMF regarding fiscal adjustments for 1987 began. The magnitude of the shock was enormous. The value of crude oil exports had contracted from $13.3 billion in 1985 to $5.6 billion in 1986.

Over the years the price formulas have been adjusted but their basic structure has remained unchanged. Changes in formula constants have been regularly implemented. New reference crudes have been selected and others discarded. Crude weights have shifted. Formulas for new markets have been added. The most important modification relates to long-term, 5 to 8 year, supply contracts that were conditional on the construction of cokers designed to run Maya crude. These included a mechanism that helped manage light–heavy price differential risk. However, looking back it is surprising to see how stable they remained in markets where everything else changed. They adapted well to developments in spot and future markets. They responded constructively to Pemex´s objectives and constraints, as well as to the Mexican institutional framework. Nevertheless, their success should not be a source of complacency. Much higher price levels, unprecedented light–heavy price differentials and refining margins, non-linear product quality differentials, changing demand patterns, new forms of speculative activity and the cyclical transition from a buyers' to a sellers' market highlight the need for a fundamental review of the performance of spot related price formulas. The timely renewal of obsolescing price formulas could generate value and lengthen their life cycle.

Asinus Muses

Preparing your next GLOCCHAR

Asinus is a member of one of the world's tiniest minorities – beings (and institutions) who have not produced a report on global climate change. After a major report to the US Congress in June, there was one from the European Commission, and then another to the British government by the ex-chief economist of the World Bank, only hours after yet another on Africa from a host of international NGOs, and so the deluge goes on. In fact, if you google 'Climate Change Report' you get 33,800,000 results. That means that for every 186 humans there is one internet reference to a Global Climate Change Report (which I will now shorten to GLOCCHAR to save energy). The supply of GLOCCHARs seems destined to expand limitlessly, with maybe a slight lull towards the end of 2007 which is when the next 'big one' (the fourth report of the International Panel on Climate Change) is due. But since virtually no one could read them all, then the impact of each report is determined entirely by whatever mention it can get in the press on its day of publication, before it is washed away by the next.

Useful tips

Based on a study of the techniques used to get GLOCCHARs noticed, Asinus suggests three basic tips.

1. Since disaster has become a banality, you have to say that the situation is much worse than dreamed of in any of the previous GLOCCHARs (much less ice, more heat, sea, desert and so on).
2. Since people are now bored with climate change itself you have to prove it is going to have an enormous and hitherto unforeseen effect on something absolutely crucial other than the climate (such as democracy, sex or immigration).
3. You have to think of some headline-grabbing and completely original actions to avoid the foreseen catastrophe.

Crying wolf convincingly

Tip 1 is inherently very difficult since the millions of already existing climate reports all say basically the same thing, and in practice the climate changes so slowly that people don't necessarily notice and so perceive the need for action. A few recent writers have tried to overcome this problem, by using the 'tipping point' technique. This recognises that not much has happened yet but adds 'just you wait because very, very soon …..' at which point you put in the tipping effect, such as a crucial temperature (just a little above the present one) which, once it is reached, will put us on the fast track to conflagration, or a slight further temperature rise which will suddenly release all the stored up methane in the tundra). But tipping effects cannot really work for long since (unless the tipping effect actually happens, in which case it will be too late to do anything) people will take the warnings with the same nonchalance as they did in pre-tipping effect epoch.

Up to 20 percent more disaster

Tip 2 is inherently easier to deal with since there are plenty of important things which have not yet been linked to climate change (same-sex marriage, the royal family, the Blair-Brown conflict, to name just a few). The p.r. of the recent report sponsored by the British government must have been inspired since the BBC web site stated that 'Global warming could cut the world's annual economic output by as much as 20%, an influential report by Sir Nicholas Stern is expected to say.' This is what you want: some dreadful consequence is predicted and the BBC declares the GLOCCHAR 'influential' even before anyone has has read it! Also note the clever use of the 'by as much as' phrase, like the 'up to' so beloved of shopkeepers (as in a shop window notice I once saw promising 'up to more than 70 percent off').

Holidays at home

Tip 3 allows great scope for imagination. Since almost everything produces greenhouse gas emissions you can select almost anything to reduce, outlaw or tax. But it must be pretty important if your GLOCCHAR is to make any impact. The European Commission's recent report was a dud since the press mainly picked up its recommendation that TVs and computers should not be left in stand-by mode; people are probably not convinced that those little lights on their personal electronics are causes of global warming to be compared with SUVs, heavy lorries or the airlines. Our neighbour organisation, the Oxford University Environmental Change Institute, did better in their recent GLOCCHAR by singling out holidays by air for special reproof, suggesting that more people should take their holidays at home (you are probably thinking Exeter by-pass traffic jams, but I ask you to remember too that English beaches mean jolly rides for children on English donkeys and that means much needed employment opportunities for my own increasingly marginalised species.) Also, as it happens, English beaches have recently got warmer, though, of course, thanks to global warming!

To sum up, a GLOCCHAR which stands out from the crowd is one which forces newspapers to summarise it in something equivalent to the all-purpose best-selling headline once devised by David Frost: TEENAGE SURGEON PRIEST IN SEX-CHANGE MERCY DASH TO PALACE. But you don't have to write a GLOCCHAR; if you don't, somebody else certainly will.

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