

The Prospects for Energy

Energy Markets and Institutions Need Strengthening

By Paul Tempest*

“The positive development of a society in the absence of creative, independent-thinking, critical individuals is as inconceivable as the development of an individual in the absence of the stimulus of the community”.

Albert Einstein

Preface

The Athenaeum, from its foundation in 1824, has had a long and distinguished involvement in the development and use of primary energy and in the original scientific research concerning the generation and use of electricity. Many Club members have since helped carry the torch of scientific enquiry in the field of global energy through to the present day.

Our first presiding Chairman, Sir Humphrey Davy, conducted fundamental electro-chemical research in the period 1801-27. Among the general public, he is still mainly remembered as the inventor of the coal-miner’s safety lamp.

Michael Faraday, our first Secretary, can claim an even greater position as the first and foremost applied scientist in the history of electricity, establishing the principles of electro-magnetic induction and constructing the first electric motor and transformer. Within the Club, he also applied himself to the problem of adequate and improved ventilation and safety in an era when the Athenaeum coal-burning fires, cooking stoves and primitive lighting presented a hazard to the health of the staff.

By 1824, steam had already begun to transform manufacturing industry, the pumping of water and transportation. Within one year, the world’s first passenger steam railway was in operation between Stockton and Darlington. Many of the “new energy” engineers such as Brunel and Stephenson joined the Club seeking and enjoying dialogue with like minds and a broadening of their horizons.

In the 20th Century, several of our 10 physicist and 11 chemist winners of the Nobel Prize and other members made key contributions which led to major advances in energy processing and use. Another member and Nobel Prize winner, Sir Winston Churchill is also remembered for his involvement in the Royal Navy’s switch from coal to oil, and, in the Second World War, in the strategic decisions to secure vital access to oil supply and to deny it where necessary. Through to present times, the Club membership has attracted a quorum of energy scientists and economists, as well as government and corporate leaders in the energy sector.

Energy is the lifeblood of the global economy today. Like the red corpuscles which the heart pumps round the human body, an abundant supply of energy - oil, natural gas, coal

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and, to a lesser extent, nuclear power and hydro-electricity - remains absolutely essential to provide the goods, services and living standards we now enjoy. There are no practical alternatives in the short-term.

Even so, two of the six billion people on earth at present have no regular access to electricity or transportation fuels and little hope in aggregate of securing such an access, as population growth is still out-stripping the spread of use of primary energy. The great disparity between energy-rich and energy-poor is, therefore, likely to persist, and the finite number of the energy-poor is steadily increasing, not decreasing.

Among the one billion global inhabitants, who consume 60% of the energy total, access to ample energy is very widely taken for granted, particularly in the industrialised world. Nonetheless, recent renewed threats to Middle East and Central Asian oil and natural gas supply and shortfalls of natural gas and electricity in California have provided a salutary warning. Without adequate contingency planning, much new technology and abundant long-term investment in new and conventional energy sources, energy supply will quickly plateau and fall, the pace of global economic growth will most certainly slacken and the system, as we know it, will atrophy.

The recent terrorist attacks in New York and Washington have demonstrated these points rather sharply – initial market panic and an oil-price spike, followed by a sag, as the prospects for economic growth were seen to weaken, indicating a marked slackening of energy investment. The trading community, which is more or less incapable of looking more than six months ahead, finds itself today expecting \$18 oil at a time when the current geo-politics of the Gulf point in the opposite direction towards multiple political explosions throughout the Middle East and the strong possibility of major interruptions to global oil and gas supply.

Security of Energy Supply

While markets remain nervous and fearful and attention is riveted on the political confrontations in the Gulf and the rapid dissolving of the anti-terrorist alliance, many nations are, therefore, now again reviewing their dependence on imported energy supply. Such imports have to be paid for. In times of shortage, there will again be very high costs and acute competition for what exports remain available in the markets. Availability cannot be assured by other means such as long-term stock-piling or long-term barter deals.

Even the largest countries are vulnerable. The United States, which absorbs one quarter of total global energy, now depends on imports for well over half its massive consumption of oil. Germany and Japan have a much greater degree of oil import dependence. China, which still uses, in per capita terms, only one-fifteenth of the energy consumed by each person in the United States, has moved in the last ten years from the ranks of major oil exporters to become a massive and growing oil importer. During the same period of ten years, Russia has seen its oil consumption cut by half and its domestic oil production slump by a third. In the coal sector, China with one quarter of global production has, within the last five years, cut its production by one third.

In the emerging world, some sixty-five countries are now massively and increasingly dependent on imported energy. Many have great difficulty now in generating hard currency to pay for these imports. Their demands are becoming more

desperate and more strident, and they are finding common ground in listening to the bin Laden/Taliban rhetoric and critique of U.S. economic policy.

These developments represent abrupt and fundamental structural change of considerable impact on the global economy, on global trading patterns, and on how each state behaves towards its neighbours, its trading partners and its commercial rivals.

Afghanistan's energy and economic isolation and deprivation has become a rallying call, which many find hard to ignore.

Let us pass on to the good news.

Market Stability

The fact that the energy market is now very much larger than ten or twenty years ago and that it will continue to grow with a more balanced energy mix, very many new players and a cross-multiplicity of interest is, on balance, a source of hope for a sound, stable network and for future long-term investment. Interdependence on traded energy should produce cooperative solutions to demand strains and supply shortfalls and above all, a much more rapid sharing of the benefits of new technology. The need for adequate energy to sustain global economic growth is now very widely understood and accepted. Indeed, the imperative of avoiding supply discontinuities such as the oil crises of 1973-4 and 1979-80 - with consequent crippling inflation, economic paralysis and turmoil in government financing and the banking sector - has brought caution and awareness to the conduct of economic policy world-wide over the past two decades. In this there is also much ground for hope.

Market Leadership

The United States has been deeply shocked, angered and saddened by recent events. It is confused by the response of the Middle East states to its new military operations in the area. Yet few question U.S. leadership in global economic finance, in the generation of new technology of all kinds including energy and in the solution of many global dilemmas. The United States has shed the constraints of the Cold War. If we are going to achieve a gradual (and it looks like a 30-50 year) transition to a hydrogen and largely non-fossil-fuel based global economy, we still need the United States to give a strong, confident, far-sighted lead.

Resource Availability

Nor do we need to be concerned about fossil-fuel availability at the global level. Proven reserve/production ratios are 40 years for oil; 60 years for natural gas; 230 years for coal. The probable reserves estimates more than double these very high numbers and these are all based on recent levels of technology, which is constantly advancing. The immediate problem is local; it concerns the market allocation of current supplies and the crucial dependence of many countries on oil supplies from the Middle East.

Oil accounts for over 40% of the global energy mix. Coal and natural gas are roughly level at 25% each. As the oil-price is the international starting-point for almost all energy pricing, it is likely to continue to be buffeted by world events and conflicts. Every collapse, say towards \$10 per barrel will, as in 1986 and 1999, bring almost every brand-new exploration project to a halt and many in the appraisal phase into a "hold" or "wait and see" status. Equally, any signifi-

cant supply threat is capable of sending prices soaring above \$30, triggering global fears of dislocation, inflation and economic recession. Thus energy investment does not proceed at all smoothly, but rather, unevenly and intermittently on the crest of giant waves.

Price Stability

Whenever the screens go blank, the air-conditioning fails or the streets are suddenly empty in United States, Europe or Japan, we can be fairly sure that the ensuing outcry will be loud enough to trigger action and that there will be a readiness to shoulder much higher energy costs than hitherto in order to draw out both new investment capital and a rational market re-allocation of existing supply.

Without the "super-majors" to turn to, we depend at present in each of these "mini" oil crises on governments and very largely on two governments - first that of the United States of America, and second, largely through the representations of the United States, that of Saudi Arabia, the single global oil producer with sufficient volume and flexibility to cut or increase its production on the scale needed to reverse the market trend. That Saudi Arabia chooses to operate through a screen or fog - that of OPEC, the now eleven-member so-called "petroleum exporting country cartel" founded in Baghdad in 1960 and domiciled in Vienna - is neither here nor there.

OPEC has, nonetheless, over the past twenty years, played, a particularly valuable role in this regulatory function. Its current \$22-28 guidelines are acceptable to most consumers and its efforts to moderate or enhance supply when necessary are largely regarded as sensible steps to achieve price stability.

New Energy Use Technology

A more significant and more efficient relief to supply/demand imbalance is more likely to come from new technology in the utilisation of energy. Here, at least, there is already clear light at the end of the fossil-fuel tunnel. Internal combustion engines are becoming less and less thirsty and less pollutant. Highly efficient combined cycle gas turbines have completely changed the market for heat and power. Hybrid petroleum/fuel cell/battery vehicles are already on sale with 70mpg (and 100mpg promised shortly), albeit at production costs much higher than their conventional equivalents. There are hydrogen and battery-powered urban coach fleets and hydrogen-fuelled delivery trucks in Chicago, Vancouver and other cities of North America. As a guide to the scale of the potential for savings, the world record for a petroleum-driven passenger vehicle has just exceeded 10,000 mpg and several vehicles have recently crossed Australia entirely on solar power.

Meanwhile, as our most congested cities slowly grind to a halt and about one third of us - two billion - suffer increasingly from the effects of urban pollution, the restructuring of the towns and cities will begin to change lifestyles and services. New public transport, city-centre pedestrianisation, licensed vehicular access, penal parking and other taxation are already becoming the norm world-wide, opening the door for new and cleaner technology.

Curbing the Military

Another area of hope is the chance of curbing the vast

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appetites of the military, particularly for gasoline, diesel and jet-fuel. Almost anywhere in the world, admirals, generals and air-commanders will assure you at any time that they need more weaponry and that, on active operational service, they have to allocate 10-20% of their pitifully tight budgets to fuel supply, without which nothing moves. If, as happened to me once in 1986, you can arrive in the Pentagon with a plausible scenario for a five-year oil-price path some five dollars below their budget assumptions, you will be greeted rapturously - rather like Santa Claus bearing sacks and sacks of additional unexpected fighter squadrons, nuclear submarines and tanks - and transported instantly - as if on a magic military carpet - from one welcoming four-star general to another and on to the very highest in the land. However, as the memory of the Cold War recedes, and if demilitarisation and disarmament ever become more fashionable, there may be scope for a reduced military demand for fuel.

Taxation

Less hope can be placed on the non-interference of governments. Energy, so inelastic in demand, is such a tempting and relatively painless source of public sector revenue.

For the producer governments who agree to restrict supply and inflate prices, the additional revenue provides first and foremost additional means to secure their regimes. It is the easy option which avoids the cost, fuss and risk of investing in new capacity and it blocks outsiders from meddling further. Pressure from consumers can be bought off with part of the enhanced income.

For the consumer governments, the myth that high taxation of oil products will curb demand can be set against the historical record and found to be largely illusory. Governments can be greedy to the point of strangling the energy cash-cow. The United States provides a model of low taxation, low subsidisation of energy, and high economic efficiency which challenges much of the logic applied in Western Europe and Japan.

The role of government in energy is thus, again, under rigorous scrutiny. A heavy hand produces inertia, inflexibility and ultimately a dangerous isolation from world markets. Civil servants and ministers are, generally speaking, no match for the formidable teams of corporate tax lawyers and consultants fielded by the companies - highly-focused, well-motivated and highly rewarded. Privatisation has proved no easy panacea and has generally led world-wide to new forms of government supervision and regulation. Brave attempts to create brand-new efficient, competitive markets out of the feeble framework of state monopolies, oligarchies and cross-industry alliances have been partly frustrated.

Institutional Weakness

What emerges strongly from the markets is a point about the political feebleness of the institutional structure. It was, you might remember, the final remark of Professor Eric Hobsbawm in his Athenaeum Lecture 2000, the third in the series. In addressing *The Prospects of Democracy*, he concluded :

“In short, we shall be facing the problems of the twenty-first century with a collection of political mechanisms dramatically ill-suited to dealing with them. They are effectively confined within the borders of nation-states, whose numbers are growing, and confront a

global world which lies beyond their range of operations. It is not even clear how far they can apply within a vast and heterogeneous territory which does possess a common political framework, like the European Union. They face and compete with a world economy effectively operating through quite different units to which considerations of political legitimacy and common interest do not apply - transnational firms. These by-pass politics so far as they can, which is very far.”

In the energy sector, the four “oil super-majors” may well survive the massive financial pressures and expectations placed upon them. Yet they are all four ill-equipped to ensure the equitable distribution of oil and gas in a supply emergency or to manage their ultimate replacement by other fuels. Many national governments are also poorly-equipped and at risk. The leading international agencies charged with this task of emergency allocation of market supply are particularly hampered.

Reform of the International Energy Agency

On the consumer side, the International Energy Agency (IEA) was founded in 1974 in Paris to represent and protect the interests of the leading industrial consuming and energy importing countries, all members of its parent body, the OECD. Since then, the IEA has developed its expertise to become No.1 in the collection, collation and analysis of global energy data. Its judgment, aggregation and informed commentaries are highly regarded and carry weight in the energy and financial markets, who also listen carefully to its scenarios and often inflated predictions of future demand. Yet, in political terms, the IEA has difficulty in representing a global international interest. It is still tied to the interests of the industrialised world and it is never possible to completely disentangle its recommendations from the interests of its largest member. Without United Nations status and without a clear UN mandate, the IEA will remain a lame duck in the formulation of a global energy policy. That it should remain tied to the interests of the industrialised world is not an acceptable way forward for the rest of the world.

There are also wider concerns regarding the probity and efficiency of global markets which impinge on the energy sector. Most leading players would prefer systems of self-regulation rather than overlapping national government legislation and ill-defined responsibilities for new international agencies. The oil futures markets, for example, are vulnerable to manipulation by irresponsible producer and financial sector interests. So far, mechanisms for accurate up-to-date data-reporting and for legal redress are scanty.

So, as Professor Hobsbawm pointed out, one of our biggest problems is the inadequacy of our institutions to handle these global issues which are playing a rapidly increasing part in our lives. New technologies will, I hope, bring new leaders and also, with them, new institutions and mechanisms, free from the baggage and inertia of the recent past and present. Meanwhile, it would be quite an easy matter for the United States to throw open the IEA to the rest of the world as a token of its concern for the energy interests of other states and as evidence that it is listening carefully to what they have to say.

Human Energy

The long-term solution of global energy supply availability lies essentially not in the ground or under the sea. To leave the future of energy entirely in the hands of assorted generals,

politicians, diplomats, economists and the like would itself be dangerous. The long-term answers must lie in the well-spring of human energy, in human ingenuity, rational analysis and common-sense and what today and always lies deeply buried in the human brain.

This gives me hope. Mankind is, through the internet and world-wide web, mobile telephone, mini-processor and other devices, on the brink of a quantum leap in non-confrontational communications between individuals and between companies world-wide, a cross-border pooling of ingenuity on a scale barely dreamed of twenty or even ten years ago, a new mechanism for concentrating human enterprise, where ego-centric, sectoral, corporate and national self-interest and other protective barriers can be progressively circumvented or dismantled, where distortion and corruption can be more quickly exposed, where opportunity and risk can be rigorously evaluated, where the lunatic fringe can be easily discredited, and where common sense and freedom of expression are likely to prevail.

One high probability is, I think, extremely important. It has been acknowledged, only for the first time this year, by the *Athenaeum* after one hundred and seventy-seven years of apparently intelligent debate among a grand total of some fourteen thousand members, all male, with the recent vote to admit women to full membership beginning 1 January 2002).

The brain-power of women, with all their innate superiority in communication and language skills, social sensitivity, multi-task dexterity, non-confrontational responses to conflict, through-life hands-on experience of caring - from the new born baby to the dying geriatric - is, through the internet and other media, being rapidly released from entrapment at home, drudgery at work and total exclusion from many, if not most, of the commanding heights of our economy, society and culture. In the 20th Century, principles of equality of opportunity have been firmly established. In the 21st Century, we can be sure that the way women think will progressively impact and modify the way we all behave and develop, hopefully with immense benefit to society, education, health and international relations.

Surely, with such a surge of human brain-power, change of direction and acceleration of technology, we will be able to continue to work out how to produce adequate energy for rising, if fluctuating, levels of economic welfare, without destroying too many other species on this fragile planet, too much of our natural environment, or even each other.

In summary, we give every indication of being able to create in time the new and cleaner energy technology we so badly need. But the way will be neither smooth nor painless. I am reminded of a remark by Dr. Samuel Johnson whose great spirit and inspiration so permeates the character of the *Athenaeum* to this day. He was speaking, admittedly, in the mid-18th Century, referring to a brewery, and addressing the feasibility of establishing new and more convivial day-care centres for those in need. No matter, the principle is what is important:

“We are not here to sell a parcel of boilers and vats, but the potentiality of growing rich beyond the dreams of avarice.”

This brings me back to the two billion global inhabitants who have not yet enjoyed - or suffered - this affluence of abundant energy. In the very long-term, I have some doubts. As I observe the frenetic, competitive stimulus of these new freedoms of electronic and satellite communication, I note, both among the young and middle-aged as well as among the elderly, the accompanying prevailing neurosis of broken-hearted individuals being cut adrift from a stable social pattern - the fear of not being able to keep up, of being side-tracked and ultimately discarded.

I find myself comparing this despair with the resilience of primitive peoples I have met deep in the rain-forests and on the remote coasts of Africa, South-east Asia, and South America. Facing daily hardship and challenge without the benefits of advanced technology, education, electricity, transport or modern medicine - or even the homely comforts of the *Athenaeum* - they clearly are also equipped with a strong energy, will, intelligence and instinct to preserve their pattern of life. We may eventually come to acknowledge that those primitive skills and mentalities are ultimately of equal, if not superior, value in the struggle of mankind to survive.



Plans are well underway for the Prague IAEE 2003 International Conference. Those meeting in Prague for the annual program committee meeting are as follows (listed from left to right): Ivan Benes – Prague Program Chair; Len Coburn – IAEE President; Virve Rouhiainen – Finish Affiliate President; Paul Tempest – IAEE Past President; Michelle Foss – IAEE President-Elect; Georg Erdmann – GEE President; Frits van Oostvoorn - IAEE Council; Jan Myslivec – Prague General Conference Chair; Jiri Schwarz – Program Committee; Roberto Rios-Herran - Program Committee.

Stay posted to the IAEE web site (www.iaee.org) for updated program announcements and hold the dates: June 5 to 7, 2003.