By Paul Tempest*

No one on this planet knows, of course, what the future will bring and those who claim to know are all either fools, self-appointed bigots, weirdos, political manipulators (some well-meaning), or outright liars. Clever economists and other soothsayers come in two categories. First, a few really valuable people who know that they do **not** know and second, a larger number who do ***not*** know that they do ***not*** know. For the rest of us, more humble, toiling in the field of energy economics, it is more a patient search through the numbers (and views of the key states, alliances and personalities involved) in search of an optimum balance of cost and long-term benefit against a tumultuous background of volatile markets, constantly improving new technology and political surprise.

In ensuring adequate energy worldwide to meet the needs of a growing global population and uncertain climate, we are talking not about the two decades ahead, but the next fifty years at least. Investment today, for example, in exploration, production, processing, transportation and distribution of hydrocarbons will, in all probability, continue to provide the bulk of those energy needs. This is no small matter. Investment in energy has to be financed, mobilised and sustained on a continuing and expanding basis; it is highly dependent on the efficient application of new technology worldwide and the rapid replacement of all that is old, inefficient and obsolete. Above all, it depends on a high level of international co-operation and shared goodwill and a global consensus that such efforts are essential for sustainable global prosperity and, indeed ultimately, for human survival.

The Gathering Strom

According to our informal Windsor Energy Group index of global goodwill, the geo-political obstacles to international trade and development have again begun to multiply alarmingly. There may be some serious trouble ahead.

In Europe the dangers of being denied, or even threatened temporarily by a denial of, oil and gas imports from Russia already colour the anxieties of the 28 members of the European Union with the fear of a widespread slowdown in manufacturing industry and economic activity. If investment plans continue to be put on hold and Western sanctions begin to bite more deeply, Russian responses will sharpen. China will probably be drawn into the confrontation and will be affected by it. Among the smaller and weaker EU members in the East, there may be panic if electricity outages, freezing homes and schools and shortages of transportation fuels begin cumulatively to sap confidence. Some of the most exposed and weaker EU members may then seek to conclude their own new Russian supply contracts with all the escalation of import cost, increased debt and erosion of trade competitiveness implied. As well as having to accept some new political strings, many other parts of the Euro-zone may well experience economic dislocation, political uncertainty and possibly social turbulence that, if unchecked, might become acute. Much will turn on whether the remarkable unity and expansion achieved by the European Community so far can be underpinned, strengthened and defended.

Another bundle of new geo-political obstacles can be traced to the bilateral energy and financial relations of Russia and China concerning the new West-East linkage of large, brand-new long-distance oil and gas pipelines supplying Russian oil and gas to the Chinese heartland. While China can provide hard currency settlement for the Russian oil and gas supplied, there is likely to be little or no problem. Yet if Chinese infrastructure costs and global investment commitments begin to outrun the Chinese Government's export revenue and available currency reserves, there may be procrastination and confrontation ahead with China searching desperately for cheaper and more secure supply and Russia suffering from a slowdown of this hydrocarbon stream and reduced inflow of capital caused by a progressive collapse of orderly and regular settlement of these bilateral accounts.

Along Russia's southern borders, we can expect a process of tightening Russian influence and control with the present military intervention in Ukraine and the Crimea providing a severe warning and example to the other former Soviet Union states if they step too far outside the guidelines set by Moscow. This seems to suggest to me that the competing oil and gas projects of these former Soviet Union states to pipe their own oil and gas directly to China and Europe may not be as simple as they originally envisaged.

Along the North African coast, the Arab Spring of 2011 appears to have run its dismal course with planned new energy investment greatly inhibited by renewed uncertainty in Libya, Egypt and further afield as in the Sudan. This confused tur-

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moil seems to be in danger of spreading further in Africa rather than diminishing.

For Russia, the difficulties of government in Iraq and a chaotic and complex civil war in Syria have raised high hopes in the Kremlin and excitement among the Russian populace of realising the Czarist centuries-old dream – that of eventually securing safe Russian access to a warm-water port, preferably in the Gulf – a new highway protected by Russian arms and expertise to the prime source of global energy exports. Meanwhile, Iran continues to pour arms and other support into Syria and Iraq and already exercises a significant level of control over parts of Southern Iraq.

A Fundamental Shift in Energy Import Dependency

Much will turn on the response of the United States to these new challenges from Russia and Iran. Within the energy sector, there are new realities to be faced. The continuing shift of Arabian Gulf exports of oil and gas from Western markets to China, Korea, Japan and some other South-East Asia states, already heavily dependent on hydrocarbon imports, has been accompanied by a fundamental reversal of trend in domestic hydrocarbon production in the United States. The shale surprise of the last five to ten years has transformed the United States from being a lead energy importer to become a much more significant exporter of U.S. coal and to become the global leader in shale development and, displacing Saudi Arabia, in the production of oil and gas liquids. The new assumption that the strengthening energy independence in the United States will persist for a long time is bound to have profound impacts on U.S. industry and on U.S. foreign policy worldwide. In the longer-term I think (and hope) that a strengthened, less energy import dependent United States could help it to re-focus its essential leadership role in applied science and the swift commercialisation of new technology.

All in all, this litany of temporary current misery is prompting the international oil and gas industry to pull in its horns and the international investor to review much more rigorously the sharp rise in political risk. Increased insurance rates and tightening banking prudence are already bringing increased costs of these services together with greater reluctance to lend without elaborate government guarantees.

New Challenges and Opportunities

Now let us try to look on the bright side.

- **Resources of Hydrocarbon**

  All those who try to tell us, for whatever reason, that global hydrocarbon resources are being exhausted and assure us that weird and wonderful windmills, landscapes of very hot glass, mega-sized tide-mills and other paraphernalia will meet all our energy needs all the time within the near future are talking poppycock. Table 1 demonstrates how primary energy consumption in non-OECD countries now exceeds by a significant margin that in the OECD states. The gap will continue to widen. Yet, as demonstrated in Table 2 the bulk of proven reserves of oil, coal and gas (now including shales) remain within a quite small group of states, who control the international markets and have a strong hand in setting global energy prices. If they continue discreetly to set price parameters acceptable to the global community, this may be no bad thing. If they become divided by pandering to national interest, the chances of the global economy weathering the storm will be diminished.

  There is a strong probability that proven global reserves of oil, gas and coal will continue to rise and remain highly cost-competitive. So we may well have adequate resources to address the risk of rising global energy poverty while preventing another global conflict for resources. We do need, however, to maintain the necessary momentum of investment, security of supply, efficient global markets downstream as well as a continuing whittling down of costs through much new technology. Provided we can eliminate the environmental damage caused by this enhanced production and a more equitable sharing of global energy, we will have very little to worry about. The need to achieve a stable global understanding of these objectives and widespread co-operation, as, for example, to protect the vital energy trade routes is a prerequisite. For this we will need a new institutional framework to replace the outworn and now flawed global supervisory systems of the past seventy years.

- **Climate Change**

  On 1st November 2014, the United Nations issued its strongest warning so far of the dire consequences of continuing climate change and the need to curb the most pollutant uses of fossil energy. Rising sea-levels and urban air and water pollution were identified as major problems. The global processing of energy at locations close to the sea-shore pose particular problems for the nuclear power industry, and for the import and export terminals of oil and coal. The liquefaction

Table 1

PRIMARY ENERGY CONSUMPTION 2013
Share of global total (12730.4 million tonnes oil equivalent)

OIL	33%	ASIA PACIFIC	41%	CHINA	23%
COAL	30%	EUROPE/EURASIA	23%	USA	18%
GAS	24%	NORTH AMERICA	22%	RUSSIA	6%
HYDRO	7%	MIDDLE EAST	6%	INDIA	5%
NUCLEAR	4%	S/CENTRAL AMERICA	5%	JAPAN	4%
RENEWABLES	2%	AFRICA	3%	REST	44%

Primary Energy Consumption by non-OECD (56.5%) now exceeds OECD states (43.5%).

GLOBAL OIL CONSUMPTION 2013
Share of global total (4185.1 million tonnes)

REGIONS		LEAD STATES	
ASIA PACIFIC	34%	USA	20%
NORTH AMERICA	25%	CHINA	13%
EUROPE/EURASIA	21%	RUSSIA	4%
MIDDLE EAST	9%	GERMANY	3%
S ./CENTRAL AMERIC A	7%	CANADA	3%
AFRICA	4%	REST	57 %

Asia Pacific plus North America and Europe/Eurasia account for 80% of total Global Oil Consumption.
USA leads with 20%. Russia lags with 4%.

GLOBAL GAS CONSUMPTION 2013
Share of global total (3020.4 million tonnes oil equivalent)

REGIONS		LEAD STATES	
EUROPE/EURASIA	32%	USA	22%
NORTH AMERICA	28%	CHINA	5%
ASIA PACIFIC	19%	IRAN	5%
MIDDLE EAST	13%	JAPAN	4%
S/CENTRAL AMERICA	5%	CANADA	3%
AFRICA	4%	REST	61%

Europe/Eurasia plus North America and Asia Pacific account for 80% of total Global Gas Consumption. USA leads with 22%. Middle East has 13% and rising.
Non-OECD has 52%, OECD 48%

GLOBAL COAL CONSUMPTION 2013
Share of global total (3826.7 million tonnes oil equivalent)

REGIONS		LEAD STATES	
ASIA PACIFIC	71%	CHINA	51%
NORTH AMERICA	13%	USA	12%
EUROPE/EURASIA	13%	RUSSIA	2%
AFRICA	3%	GERMANY	2%
S/CENTRAL AMERICA	1%	REST	33%

Asia Pacific consumes 71% of total coal consumption. China consumes more than half the total
Non-OECD consumes 72%; OECD 28%

Source: BP Statistical Review of World Energy, published June 2014

Table 2

PROVED OIL, GAS and COAL RESERVES end-2013

PROVED OIL RESERVES end-2013
Share of global total (1687.9 thousand million tonnes)

REGIONS		LEAD STATES	
MIDDLE EAST	48%	VENEZUELA	18%
S/CENTRAL AMERICA	20%	SAUDI ARABIA	16%
NORTH AMERICA	14%	CANADA	10%
EUROPE/EURASIA	9%	IRAN	9%
AFRICA	8%	IRAQ	9%
ASIA PACIFIC	3%	KUWAIT	6%

Middle East has almost half the total. Venezuela plus Saudi Arabia have 34%
Oil reserves have risen steadily: increasing 62% since end-1993

PROVED GAS RESERVES end-2013
Share of global total 2013 (185.2 trillion cubic metres)

REGIONS		LEAD STATES	
MIDDLE EAST	43%	IRAN	18%
EUROPE/EURASIA	31%	RUSSIA	18%
ASIA PACIFIC	8%	QATAR	13%
AFRICA	8%	USA	5%
NORTH AMERICA	6%	VENEZUELA	3%
S/CENTRAL AMERICA	4%	REST	43%

Middle East leads with 43%. Iran and Russia with Qatar account for half the total . Total gas reserves have risen by 57% since 1993 and are rising fast with new shale and other discoveries. Non-OECD have 90%; OECD 10%.

PROVED COAL RESERVES end-2013
Share of global total 2013 (891,531 million tonnes)

REGIONS		LEAD STATES	
EUROPE/EURASIA	35%	USA	27%
ASIA PACIFIC	32%	RUSSIA	18%
NORTH AMERICA	29%	CHINA	13%
MIDDLE EAST + AFRICA	4%	INDIA	7%
S/CENTRAL AMERICA	2%	GERMANY	5%

USA (27%) together with Russia and China account for almost 60% of the total. Non-OECD states have 56.8% of the total, OECD states 43.2%. Former Soviet Union 25.6% and European Union 6.3%

Source: BP Statistical Review of World Energy, June 2014

and re-gasifying of natural gas have come under much closer scrutiny, while the safe storage of nuclear waste remains under review. The lesson of the past century is that the energy industries do find solutions to these problems, particularly when prompted by local disasters.

- **Alternative Energy**
  Alternative energy will have a valuable but small and costly part to play in the evolving global energy mix giving significant opportunities particularly in those states lacking domestic resources, nuclear power or hydroelectricity potential. The Achilles heel of alternative energy lies in its unpredictable intermittency, high capital and maintenance cost and dependence on rising government subsidies.
- **The Nuclear Dilemma**
  The proliferation of nuclear and chemical weapons has cast a heavy shadow over the growth of nuclear power. There have been other developments which could not have been foreseen ten years ago. The recent decisions of the Japanese government and those of Germany to scale down their nuclear generation capacity have had profound and costly impacts on the performance of their economies.
- **Extremism and Terrorism**
  We should not be too despondent about any apparently insoluble absence of geo-political alignment or about threats from spreading extremism and terrorism. For the oil and gas industries there is now a very pressing problem. How do you protect your workers and staff in very isolated and vulnerable locations?
  The three global leaders, USA, China and Russia share much common ground in combating global and regional terrorism With goodwill, solutions will be found to resolve their current conflicts of interest and, hopefully, the process of increasing consensus will be the foundation for continuing economic prosperity and greatly enhanced protection of individuals and vulnerable minorities.
- **The Role of the National Energy Companies**
  The need to protect the national interest lies behind the development of many of the leading national energy companies. Many have gone on to develop extensive interests overseas and to acquire a capability to absorb new technology and to establish new markets. Problems arise for the smaller national companies which struggle to compete against the giants in the global market for external finance, the latest equipment, skills and technology and the management of their own often highly complex development projects.
- **The Role of the Multinationals**
  Generally speaking, the multinational oil and gas companies are in good shape, well-run, supported by excellent global service companies and able to perform a dynamic role in the global economy. Their accumulated skills and experience are absolutely essential for a favourable economic outcome over the next fifty years.
- **Hybrid Development**
  The continued success of the best examples of co-operation between multinationals and national oil companies will provide an efficient model for replication widely worldwide.

Changes in Global Energy Trade and Investment

To summarise: my argument so far is that the global demand for energy looks like accelerating faster than population growth as expectations of betterment fed by vastly improved telecommunications and enhanced personal access are experienced worldwide. We may need to plan for a doubling of global energy demand within fifty years, even possibly by 2050. By then we will need a whole bundle of new technology – advances in chemical energy, much more efficient energy use, nuclear fusion, breakthroughs in cheaper electricity transmission, geo-thermal, solar or whatever. Today, at least we know we have the resources to bridge the gap by expanding hydrocarbon output massively. This will require much enhanced consensus worldwide on the need for this expansion whatever increased efficiencies of energy use can meanwhile be achieved. Such an expansion requires continuity of investment and sustainability in environmental terms in a much more peaceful political environment.

Human Energy-Keep Calm but Care

Rather than go on too long about global generalities and uncertainties, I have also collected some notes and impressions based on the global, regional and national energy issues I have been involved in over the past fifty years. The UK Official Secrets Act as well as security declarations in the Bank of England, HM Treasury, Shell International, British Gas, the World Bank and World Petroleum Council

inhibit me, of course, from disclosing anything that might be considered secret or confidential, including the names of those involved, but throughout all this time I kept a private notebook of those muddles and mistakes and obstacles that we encountered. Jotting them down provided a sort of therapy for the frustration, irritation and delay that they had caused. These notes also built up a useful reminder of how those obstacles were often overcome by innovative surprises, new alliances and sensitive re-thinking of the fundamental long-term interest of all the parties involved or affected. Only well-directed human energy can resolve our future trials.

After the Storm Comes the Peace

In 1954-1956 I spent my two years of National Service in the Royal Engineers where the inculcation of basic military training at Mons Officer Cadet School at Aldershot, UK proved of inestimable value later in life in the Bank of England and with Shell and elsewhere. I have long since lost my copy of the Queen's Regulations and other documentation, but fifteen of the basic points of an infantry attack were burned into my soul like a firebrand at age 18 and remain fresh in my mind to this day. They will serve here as a template for my final thoughts on the future of energy on this planet.

- **The Ultimate Objective** – What are we trying to achieve over the long-term?
- **The Immediate Objective** – What do we have to achieve now?
- **Resources** – Are they available, replenishable, cost-effective and ready to hand?
- **Intelligence** – Do we know precisely what we are up against?
- **Obstacles** – How do we eliminate the main obstacles?
- **Surprise** – How can we find answers and strike targets in new ways from new angles?
- **Superior Technology and Skills** – What are our greatest strengths?
- **Searching for Comparative Weakness** – Which gaps can we remedy?
- **Effective Communication and Coordination** – Can all units communicate well with an overall strategy and command centre?
- **Simple Orders** – Can all units understand their instructions and their specific role?
- **Concentration of Fire** - How can the impact of well-timed coordinated action be enhanced?
- **Reinforcement Options** – Where do we turn for more support?
- **Securing the Ground** – Do we have a good plan for defending the area taken?
- **Follow-up** – Unforeseen casualties? Other unforeseen consequences?
- **Contingency Planning** – What to do if resistance is stronger than expected?

I have one other point. I was not a particularly gifted soldier. Indeed I still remember the remarks expressed early each morning on the parade ground by our Regimental Sergeant Major pointing out rather loudly that my performance of the Regimental Slow March could be likened to that of a pregnant duck. He was on the right track. His job was to sharpen up our performance and in this he was remarkably successful. But from him and others much later in life I learned another lesson:

- **Do We Really Need to Resort to Military Solutions?** – What are the alternatives? We are already well beyond the point where regional military intervention can add to global security. The need today for effective co-operation is paramount. The age of political, military and economic imperialism has passed. Can we secure our long-term objectives by other means: more positive, sensitive and appropriate diplomacy, a stronger case for a better sharing of resources, a building-up of goodwill through better, more-purpose-orientated institutions yielding strong economic and political dividends of global value?