ENERGY: A GREAT DEAL OF HOT AIR AND LITTLE SENSE

Energy is one of the great debating subjects of the decade. And it is likely to remain so for some time. But are we really making progress in resolving some of the critical issues, or are we really just on an increasingly polarised course between different interests who are implacably opposed to entering into dialogue? I fear so if the situation in the small country of Scotland is anything to go by. Nuclear generation for electricity is a 'no no' and renewables especially wind are the saviour according to the so-called environmental groups. Industrialists, economists and industry experts talk about security of supply and worry about price escalation and the instability of governments in major energy supply countries. And the consumer is increasingly concerned that the lights may go out, that prices will rise and they will not be able to afford well heated houses and the normal range of consumer goods requiring energy to operate them. As a result, politicians have a field day by trying to drive the agenda in a direction which suits them. All of this is most unsatisfactory and is damaging to society, to the economy and to the environment. So what is the solution? There is not a simple answer to this vitally important question.

It was for this reason that a number of experts on various aspects of energy along with economists and environmental specialists formed a committee under the aegis of the Royal Society of Edinburgh (Scotland's national academy of science, technology, humanities and the arts) to inquire into energy issues for Scotland. The reports from the study and from a subsequent round of public debates are available on the Society's web site www.royalsoced.org.uk[1].

I shall focus on three key aspects of energy: what a nation should achieve, what are the objective realities and the unsupported myths, and how to stimulate reasoned debate to provoke the necessary action.

Energy strategy

What most of the debates seem to ignore is the need for an overall energy policy with a clearly defined set of aims and objectives and means of measuring their achievement. This is not an arid exercise as until all stakeholders have a common view of why we need energy and the consequences of potential shortage of supplies, of over consumption, of price inelasticity, of the social, economic and environmental effects of different approaches, then little or no progress can be made. It is very obvious to those like myself who have worked on energy, economic development and environment that a range of objectives needs to be satisfied through the types and rates of energy we consume as a society. Energy is needed to sustain existing economic activity and to stimulate new activity. Energy is needed for human survival and should have an aim of reducing poverty (and specially fuel poverty) and seeking to attain greater social harmony and the removal of social disparities. And energy must be obtained from sources and used in ways which will have the least damage to environmental systems and processes on land, in the air and at sea. These are not mutually exclusive and should not be traded one against the other.

[1] The Royal Society of Edinburgh 2006 *Inquiry into Energy Issues for Scotland: Final Report.* The Royal Society of Edinburgh 2006 *Inquiry into Energy Issues for Scotland: Summary Report.* The Royal Society of Edinburgh 2007 *Energy for Scotland: A Call for Action.*

In our Scottish study, we concluded that "Scotland should think in a global context and act locally using natural resources at its disposal to provide social, economic and environmental benefits". Following from this statement, guided by the Brundtland commission's enduring statements of almost two decades ago, we determined that the strategic aim should be "a secure, competitive, socially equitable and low carbon emission supply of energy". Our interpretation of these elements were as follows. 'Secure' means having sufficiency of supply from a diversity of fuel types and geographical sources using a variety of technologies, encouraging new technological development to marketability and having the appropriate government framework and instruments. 'Competitive' means that the cost of energy will not result in Scotland being uncompetitive in world markets and will also be competitive in the use of technology and innovation. 'Socially equitable' means that all sectors of society should have access to energy at a price which they can afford, implying that some economically and socially poorer sections of society will be aided to rise out of 'fuel poverty'. 'Low carbon emissions' mean that throughout their lifecycle technologies should produce the lowest possible levels of greenhouse gas emissions, bearing in mind that there are no technologies or energy sources that have no emissions during their lifecycle.

It is pointless having clear goals and aims without defining a clear set of objectives. In the light of our comprehensive aim we determined the following 4 objectives:

1. To encourage energy efficiency to benefit economic development;
2. To ensure that energy availability contributes to improvements in social benefits;
3. To minimise environmental effects globally and locally; and
4. To capitalise on natural energy resources in economically viable and environmentally sensitive way.

Myths and realities

The second step in formulating energy policy to achieve multiple benefits is to assess the factual material about supply and demand, consumption and the use of different energy sources and technologies as a basis for informing debate on realities and challenging many strongly held views and opinions which frequently have no factual basis. This is important for a number of reasons. In Scotland, and in the UK as a whole, for example most of the debate is about the energy sources for future electricity generation, whereas heating and transport are by far the largest energy consumers compared with electricity production. Analysis of energy flow statistics also reveals that a great deal of energy is lost at varying stages: in production of especially at large generating stations, and in energy loss from domestic premises. Hence energy savings and energy efficiency measures are widely regarded as the most crucial first step in dealing with the imbalance between supply and demand, and also helping to deal with the high costs of energy by reducing consumption. Public attitudes towards energy consumption and especially savings are increasingly important in post industrialised countries. Only with very large increases in energy costs that are sustained over long periods of time is there likely to be a reduction in use of energy especially in domestic households.

Energy use is highly variable during the day due to social habits and economic activity, and also through the year due to the obvious seasonality factors of the weather. These variations have to be taken into account in developing reliable and

robust energy supply schemes and ensuring that there is an adequate stockpile of energy resources.

It is also important to gather objective information on the source of energy raw materials used, including the type of energy material, and its geographical provenance, and on the technology used, including its reliability to transform it into consumable energy.

There are also, at least in the part of the world where I live, many **energy myths**. On the supply side those who are that we past the point of 'peak oil' but ignore the as yet undiscovered hydrocarbon reserves on the ocean shelves, ignore the new technologies which result in a greater proportion of the resource being extracted and significantly ignore human ingenuity in finding energy sources that previous generations had missed. Those who continue to claim that there is no link between emissions to the atmosphere of greenhouse gases from the use of fossil fuels ignore virtually all of the scientific evidence. Indeed, those who claim that the conclusions of the scientists within the IPCC are gagged and neutered by governments seem to live in some cloud cuckoo land of their own making. Others consider that renewable resources are infinite. This is true as we can reasonably assume, for example, that solar energy resources and tidal energy resources will last until such time as the relationship between the earth and the other planets is fundamentally different. I know of no geological predictions that these relationships will change in even hundreds of millions of years. However, we cannot assume that exploitation of these renewable resources is entirely environmentally benign. Tidal barrages have a significant effect on terrestrial and near shore hydrology and biodiversity. Wave devises for example will affect society's perception of the coastal environment, and potentially have an effect on inshore fisheries. Onshore wind devises can have a very significant effect on landscape and society's perception of its attractiveness, as well as on the diurnal migration pattern of certain bird species. Hydro-electric power significantly changes the hydrological and sedimentation system and can result in high risk to communities downstream. And all technologies, whether relying on non-renewable or renewable energy resources consume energy in their construction and emplacement and in their decommissioning.

In the UK, there has been an assumption that the market has the solution to satisfy society's energy needs. There is patently not true as, for example, there remains an imbalance between the profits of the privatised industry and the escalating costs which the consumer has to pay.

In our Scottish study, it also became clear that there were no a number of other widely held beliefs on energy. For example, it is stated frequently that renewable sources can meet the energy gap once the large scale coal, gas and nuclear powered generating stations are closed. Yet this views fails to recognise the variability of the supply sources over which we have little control, that we had as yet not cracked the means of long term storage of energy (except though pumped storage schemes), and that the means of gathering electricity from a wide range of episodic sources and delivering supply to consumers at some distance from the generation point is technologically possible in theory, but in practice is very difficult to achieve with the present grid transmission system. Also on electricity, there is a widely held view that wind generated electricity can replace nuclear generated electricity. This is nonsense.

Nuclear generation provides base load electricity supply, i.e. what we need every day of the year, whereas wind can only provide episodically the top up. In our present situation, it is difficult to see how supplies of electricity to meet the variable daily and seasonal demands can be met without use of large scale generating stations. The problem then is to find the most environmentally benign technologies. Although there are many on the drawing board, such as clean coal and carbon sequestration technologies, they are still a long way off full scale commercial operation.

Finally in relation to energy myths, we have to realise that consumer behaviour is an important factor. Will consumers change their behaviour and reduce their energy consumption? There is no clear evidence of this occurring and economists consider that prices will have to be sustained at a very high level for a long time for them to have real impact on consumption. In a curious way, opinion surveys suggest that people are prepared to pay more for energy, but the level of complaint about rising prices seems to be contrary to this expectation. The fact of the matter is that in countries like the UK energy prices have been low for many years and the recent price escalation was to be expected at some stage.

From the analysis of energy data there are what I would call a number of **energy truths**. Although many of these are disputed by some commentators, there is a high degree of scientific consensus about their veracity. So for the sake of stimulating debate we must be sure that we have the factual basis behind statements. Those we have used in these circumstances in Scotland are as follows. There is substantive evidence to link global climate change with the increase in the emission of greenhouse gases in the atmosphere arising from human activities in recent centuries. Despite technological advancement, as identified above, fossil fuel supplies in are decline. Estimates of the time scale of the decline vary. The best evidence we gathered in our Inquiry suggested that oil supplies can last for at least another 30 to 40 years, gas 70 years and coal 250 years at present rates of consumption. Nevertheless, as recent experience has shown, prices are volatile and security of supply uncertain due to a range of geopolitical factors which make predications difficult. And at the same time in the UK and in many other post industrial countries, consumption is rising; and, in addition, in industrialising countries the rise is at a very high rate. At the same time, many post industrialised countries, and most certainly the UK, have a poor record is energy savings and energy efficiency.

Stimulating debate

Given the vital importance of energy to our societal well being and economic progress and the impact that its exploitation and use has on the environment, there is a need to stimulate debate on energy futures. In Scotland, we determined at the end of the formal energy inquiry that stimulating debate within civil society was a necessary next step[2]. This was unusual for the Royal Society of Edinburgh, especially as it tends to hold most of its events in Edinburgh. We agreed to hold a series of debates around Scotland. We chose the main population centres to host evening public discussion forums. In total over six locations we had 455 participants. In additional, we decided that the views of the younger generation were essential and would likely give a

[2] . The Royal Society of Edinburgh 2007 *Energy for Scotland: A Call for Action.*

different perspective. We engaged with 407 students in the 15 to 17 age range in 14 schools around Scotland.

In order to stimulate debate we identified in opening presentations a range of issues. We sought to steer the debates in to the wider energy issues rather than focus on the specificities of the electricity debate (nuclear versus renewables, onshore wind versus offshore sources). But such was the strength of opinion and knowledge that, inevitably, these were the most debated topics and the ones on which there was no consensus.

From all of these sessions we identified areas of general consensus and areas of continuing debate, identified issues which varied by location and specifically recorded the perspectives of the younger generation.

The points of general consensus arising from the public sessions were as follows:

1. Recognition of the link between emissions from fossil fuels and global climate change.
2. Agreement that renewable sources of energy are a key contributor to energy supply needs because of their low greenhouse gas emissions, the abundance of the Scottish resource, and the need to encourage technologies other than onshore wind, for example tidal, wave, solar, biomass, and offshore wind.
3. Recognition of the need for energy savings to preserve supplies and to reduce environmental effects, and especially the need to reduce the waste of energy, coupled with more effective instruments for encouraging energy saving.
4. Recognition of the technological expertise on energy based in Scotland and the need for further support for technological development.
5. A call for new thinking on the way energy is supplied to the consumers, especially through distributed systems and micro approaches.
6. A call for new fuels provided they are economic and environmentally neutral.
7. Recognition of the need for action at political, industry and societal (including personal levels) following proper debate.

There was a lack of consensus on many issues as follows:

1. The key objectives of public policy: greenhouse gas emission reduction, and/or security of supply. Balancing the benefits and costs to the environment was considered to be very difficult.
2. Ethics was a major issue, specifically whether Scotland, as a small country with low emissions in total in global terms, should do anything at all or whether it should be an exemplar to other countries.
3. There was inresolved debate on whether renewable sources bring real economic, social and environmental benefits to Scotland. There are many concerns that one solution was being over promoted, often termed ‘the dash for wind’, and that other solutions were being given less prominence.
4. Energy price trends are not clear and it is debatable whether the consumer is prepared to pay more. Only consistently much higher prices might change behaviour in favour of greater savings and efficiency, but is this ethically defensible?
5. On alternative sources of supply, there was no consensus on the immediate solutions, such as renewables versus new large generating plant for electricity, and the unresolved arguments about whether supply should be from the source

nearest to the consumer or at the most advantageous point of high energy resource. Also the debate on the balance between fossil fuels and renewables is unresolved.

6. The greatest disagreements consistently were on the technologies for electricity generation. The polarities are:
    - nuclear has to be key part of shorter term solution given the improved technology and costs, and the excellent safety and delivery records of existing civil nuclear reactors, or there should never be any more nuclear powered electricity generating stations in Scotland because of the lack of action on storage of high level radioactive waste and concerns about the military use of fuel;
    - onshore wind has been given too much prominence compared to other renewable technologies;
    - there remains large resources of fossil fuels for decades (oil and gas) and for centuries (coal and uranium);
    - there is no consensus on the need for and effect of transmission lines on the environment and on nearby communities and options for under-grounding or for offshore routes; and
    - there are doubts about the practically of some new technologies, such as carbon sequestration in clean coal technology.

In the schools discussions, there was a much greater degree of optimism. There was always a clear view that 'the lights will not go out' within a decade because of human ingenuity and a mixture of existing and new technologies being available. Furthermore, the polarities which existed in the public sessions with regard to technologies for electricity generation were much less evident in the school discussions. There was a strong view that a change in culture was needed to wean society off its dependency on fossil fuels. Alongside this, was an appreciation of the need for energy savings and greater information on what can be done to achieve these savings, and the need for alternative fuels for transport and heating. Most students recognised the link between global climate change and the use of fossil fuels and therefore the need for precautionary action to mitigate climate change. There was a perception amongst the students that their views and opinions were not being sought on energy issues and that meant they could not influence decisions.

It was clear from all of the debates that action was needed and the following specific issues for action were identified:

1. Higher priority and more funding to cleaner fossil fuel technologies and to alternative renewable technologies.
2. Decisions on new base load electricity supply, including decisions on fuel types and final decisions on whether nuclear or not.
3. More effective energy efficiency and energy savings measures and gadgets accessible to the public to stimulate higher levels of performance. Better designed and more affordable energy savings in 'white goods'. Break the circularity of save costs on energy/buy more energy consuming devises through public education.
4. More financial support from government for bringing energy technologies from the laboratory to full-scale operation.

In order to test the local responses, we organised a conference to conclude our work and invited major figures in the international energy world to participate so that we could call for action with the support of public and industry opinion behind us. The consensus at the conference was that Scotland is no different from other countries and we needed to think in a global context as well as act locally. Claims that there were choices to be made between, for example, central and decentralized systems of electricity supply, between specific technologies or a mix, between supply led approaches or demand management, or concentration on Scotland as a net energy exporter or importer were not accepted. The general consensus emerging was that a mix of solutions, rather than selecting specific winners, was the most sensible course of action. The mix should comprise of old technologies with improved carbon sequestration, new technologies, energy efficiency and energy savings.

Debates could be never ending on polarised issues. To prepare the ground for timely and effective decisions, it was necessary for more objective information to be provided, and for consensus building. The overwhelming priorities for action identified were:

- improvement in the efficient use of energy, and
- reducing the use of fossil fuels in space and water heating and in transport.

There is a wide consensus on the need to constrain the rate of growth of consumption, and to reduce the use of fossil fuels and so reduce the emission of greenhouse gases.

We concluded that to improve the quality of debate and to ensure that the decision-making process is better informed:

- an objective methodology to assess the relative merits of energy technologies, including full lifetime costs was urgently required; and
- bodies independent of government and sectoral interests should be active in stimulating the debate and the identification of decisions needed and the urgency of the situation.

In the wider global and regional debates on energy, I consider that IUCN has a major role to play. It should use its convening power to bring together the various interests, just as it did with the mining industry. I recognise that there are those in IUCN who consider that these discussions and engagements are a step too far, but without them we will not achieve a greater understanding of the different perspectives. If we feel we can stand on the sidelines and shout our views and opinions and be heard then we loose our credibility and fail to use the convening power and knowledge base that exists within the Union.

Conclusion

Energy is a vital matter for societies throughout the world. It is also vital that environmental interests engage with civil society and with the energy industry to indentify the common ground, to determine the areas of divergence and the topics where agreement is unlikely and to consider what action should be taken.

I hope that the model we used in Scotland is of some interest and might be applied by independent bodies in other parts of the world. An editorial in the international

scientific journal Nature[3] stated that 'The Royal Society of Edinburgh is to be congratulated on bringing some sanity to the energy debate that is becoming unhinged from reality'. I hope that others, and especially IUCN, will take up the challenge.

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[3] 'Urgent but balanced', *Nature*, issue 7096, 22 June 2006, p. 907.