THE FOUNDATION FOR SCIENCE AND TECHNOLOGY

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DINNER/DISCUSSION SUMMARY

Adapting to and mitigating the impacts of climate change; the engineering challange

Held at The Royal Society on 16th October 2007

We are grateful to
Alstom, The Institution of Engineering and Technology (The IET), Engineering and Physical Sciences Research Council, Natural Environment Research Council, The Royal Academy of Engineering and Science and Technology Facilities Council for supporting this meeting

Chair: **The Earl of Selborne KBE FRS**
Chairman, The Foundation for Science and Technology

Speakers: **Dr Scott Steedman FREng FICE**
Vice-President, The Royal Academy of Engineering,
speaking on behalf of **The Lord Browne of Madingley**, FRS FREng, President of The Royal Academy of Engineering
John Loughhead
President, The Institution of Engineering and Technology (The IET)
Rolfe Tolle
Director, Franchise Performance, Lloyd's of London

DR. STEEDMAN speaking on behalf of Lord Browne of Madingley said that the role of scientists and engineers was to understand why problems arose, where we stood in relation to them and what were the options for dealing with them. They should provide - if possible - a single point of view from which to inform and advise. They could not be policy makers - that was for Ministers. He outlined the various areas in which actions could be taken to stabilize emissions – the Socolow's wedges[1]. But action required difficult government decisions if target reductions were to be met - e.g. on nuclear, CO_2 sequestration, and land requirement for bio-fuels. The public must understand and adopt demand reduction measures - particularly in domestic use. Real time pricing and large scale demonstration projects were vital. Business must accept the consequences of global warming, and anticipate both the constraints on some activities, and the incentives to others but Government must demonstrate leadership, both internationally and domestically. It should have an international climate change policy, promoting an International Climate Change Agency charged with creating a business plan to achieve best results with least costs. The Agency would establish GHG goals, propose emission targets, issues allowances, decide on mechanisms, promote technology transfer and monitor results. Transitional and long term incentives, regulation, promotion of new technologies, removal of policy barriers, were all necessary. But we must act now; time was running out.

MR. LOUGHHEAD outlined the contribution that engineering could make in a number of areas, provided government gave the leadership and resources were made available. Rapid progress could be made in clean fossil fuel technology: for example, advanced steam turbine cycle (requiring innovative materials science); integrated gasification combined cycle; carbon capture and sequestration, and alternatives to coal (such as Syngas in Australia). But action must be taken now to resolve the difficult policy issues e.g. where to put sequestered CO_2 (how fast can we build the necessary "Sleipners"?). To meet the Government's 20% renewables target, a 34% reduction must be found in the power sector, but how? Enormous amounts of land would be necessary for bio-fuels, 10,000 more turbines would be needed for wind, the harsh environment gave great problems for waves, and tidal power raised engineering and environmental problems. Meanwhile, energy conservation and demand reduction were crucial - and this could only be done by the public accepting the need, and government giving firm leadership. In the longer term, we must strive for a lower energy society, with distributed generation providing energy from fusion, solar, bio-energy, nuclear and hydrogen. There needed to be research and development from the atomic to the system level.

MR. TOLLE outlined the insurer's perspective. He illustrated the sharp increase in the costs of claims for property damage from wind, flood, subsidence and fire. The increase came not only from inflation, the severity of damage and the number of claims but also from demographic and economic factors - people living longer, moving to new areas and having more valuable assets. Between 2005 and 2007 Lloyds syndicates risk scenarios showed an $8bn increase from these factors. Significant political, legal and terrorist liabilities were also emerging - businesses affected by unanticipated regulations, house owners seeking to blame architects or planners for not foreseeing events, generators accused of emitting GHGs and desperate populations fleeing from flood or drought affected areas. Increases in liabilities from whatever source, would affect both capital requirements and the values of assets. So premiums were bound to rise. Indeed, in some areas - for example flood plains - cover might become unattainable. Policy holders could do something to help themselves - be in effect their own risk managers. But the leadership must

[1] Pacala, S and Socolow, R, 2004, Science, Vol 305, p968 to 972

come from government in the form of better planning policies, improved building codes (these could save substantial emissions), and publicising information. In short, there needed to be a partnership between policy holders, the government and the insurance industry.

In the following discussion, there was some disquiet that not sufficient emphasis had been placed on adaptation, as opposed to mitigation - which was all very well but would not deal with the fundamental problems caused by our high energy consumption. What, for example, should be done to retrofit the existing housing stock to reduce energy for both heating and cooling (more energy is now used in London for cooling than heating); or to change transport habits? It was not enough for engineers and scientists to say that they knew how, for example, houses could be insulated and vehicle traffic reduced, and then suggest that the rest is up to government to make decisions. Of course, responsible engineers and scientists were aware of climate change and its consequences, and sought to provide information, but information to whom and with what sense of urgency? Speakers agreed with the presenters that significant change in the public's habits and expectations would not come about without strong leadership from government and the public taking ownership of the changes which needed to be brought about, if emissions were to be reduced.

Should it not be part of the engineering profession's remit to work forcibly to educate the public and not simply inform ministers and to have a firm policy line which Ministers should be pressured to accept? There were clearly dangers here, when professional organizations went beyond informing and advising and became pressure groups advocating particular policies. But, as all agreed, time was running out; action needed to be taken now. It was not a question of advocating one policy (say nuclear) to the exclusion of others, but of forcing the examination of all options and the taking of decisions on those which were immediately feasible. It was welcome news that the profession, under the guidance of The Royal Academy of Engineering, had agreed a common message on climate change, but that was not enough, for, as several speakers said the government was not listening to engineers. This might be because there was not an adequate engineering expertise within government, but if this were so, it added to the case for the profession being more proactive.

Further discussion centred on the organization of government and its inability to persuade the public of the urgency of the need to take action to deal with climate change. Within government, the problem was not having a single Department responsible for energy, because no single department could be responsible for all the issues flowing from climate change. As one speaker said, it would not be a Department of Energy, but a Department of Everything. It was that there was no overall vision or sense of urgency - although there was some hope that the new proposed Cabinet Committee would help. But whatever action government took, it would have to overcome the deep reluctance - or inability - of the public to look further than the immediate future. The public saw climate change as something that could be dealt with in due time - it was not going to pose difficult problems for them tomorrow, in the way that tax increases or education or health issues did. Decisions - whether personal or national - could always be pushed into the future. Dealing with climate change should be seen as such a serious problem that it should be addressed as if it were a war and decisions taken on a war footing. If government allowed delays of 5 years for planning permission for the landing line for an off shore wind farm, or 15 years to build a Thames barrier, or 10 years for revising building codes, then they demonstrated that they had not seized the seriousness of the issue.

While speakers accepted the international dimension of climate change, there was some scepticism about the idea of a new international body; perhaps a World Environmental Organization, modelled on the WTO pattern, might help. But it must be understood that if any government were to agree to international action, it must be convinced that such action was also in its own national interests. Government would be influenced by fuel security questions, and it was important for the decisions about nuclear and long term research (for example, support of fusion) to be seen in the context of concern about the provenance of hydrocarbons. Speakers were also concerned about the lack of understanding about the international effort that would be needed to secure some of the mitigation measures, such as carbon capture and sequestration. For that to be effective, resources and organization comparable to that of the existing oil and gas industry was needed; in short the presence and power of the major global energy companies. Astute oil majors should already be looking at new activities in this area.

The final and inevitable question was - was the profession confident that there would be enough engineers to design, develop and maintain the work on, for example, clean fossil fuel and nuclear technology? The answer, equally inevitably, was no; the concern about insufficient entry into the profession, and poor public perception of engineers, had not changed. .

Sir Geoffrey Chipperfield KCB

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