THE FOUNDATION FOR SCIENCE AND TECHNOLOGY

DINNER/DISCUSSION SUMMARY

Carbon Abatement Technology

Held at The Royal Society on Tuesday 25th October, 2005

We are grateful to the following for support for this meeting:
E. ON UK, Power Technology, European Carbon Exchange and the Nuclear Industry Association

Chair: **The Rt Hon the Lord Jenkin of Roding**
Chairman, The Foundation for Science and Technology

Speakers: **Malcolm Wicks MP**
Minister of State for Energy, DTI
Nick Otter OBE
Director, Technology and External Affairs, ALSTOM Power
Dr Kjell Bendiksen
President, Institute for Energy Technology (IFE), Norway

MR. WICKS said the Government was well aware of the priority that must be given to energy matters. The Prime minister wanted recommendations from the Energy Review and Treasury Review in 2006. Carbon Abatement Technologies (CATS) were a crucial component of the strategy necessary to achieve the Government's aim of reducing CO_2 emissions by 10% by 2010 and 60% by 2050 – a period in which reliance on fossil fuels would increase, rather than diminish. Together with energy efficiency measures they would be one of a portfolio of sustainable technologies; the government had committed £25m to demonstration projects. Although it was true that there was much interest in CATS, significant R&D – to which the Government had committed £4m - needed to be undertaken if they were to become commercially viable by 2020. But equally important was establishing a stable regulatory and fiscal environment, covering legal restrictions on offshore development, carbon credits, safety and monitoring. Major demonstration projects needed to be launched to show CATS in action – the BP/Scottish & Southern Energy project was a good start. He was pleased that UK companies and the EU were enthusiastic about such schemes. Even OPEC had participated in discussions with the EU on CATS. It was vital that the scientific, engineering and financial communities worked together to drive progress further.

MR. OTTER described the immediate future as a transition period towards zero carbon emission. He emphasised the huge and growing increase in commissions for power plant in recent years – particularly from China and India. In 2015 China would have overtaken the US as the largest CO_2 emitting country. This equipment would be highly efficient, compared with EU plant, much of which was over 30 years old. It was vital to look beyond Kyoto I and consider how developing countries were to be brought into carbon reduction strategies. Carbon trading had started well, but Kyoto incentives applied only partially. He agreed with Mr. Wicks that reliance on fossil fuels would continue, which made it all the more important to develop clean carbon technologies, even although these could be only one element in an overall strategy. We needed incentives to encourage countries and companies to bring into operation high efficiency plant and CATS. Transparent and stable regulatory regimes, with a realistic price for carbon must crucial elements in developing such incentives. He was pleased that energy, and within energy, carbon capture technologies, were highlighted in the EU FP7 plan. This would set the agenda over the next 30 years for establishing a critical mass of Zero Emitting Fossil Fuel Plant. However, this must be set in its international context, which would cover new scientific advances, such as fuel cells, and transport. The G8 action plan was valuable, but continued effort was necessary to clarify the future, establish adequate incentives and firm up programmes to fulfil the strategy.

DR. BENDIKSEN struck a sombre note. He stressed the exponential growth in energy consumption between 1850 and 2030, with carbon fuels rising to 90% of production. Growth over the next 20 years will be largely in non-OECD countries. Challenges were how to deal with this immanent growth, how to stabilise CO_2 content in the atmosphere, and how drastically to reduce future CO_2 emissions. Use of solar energy must play a part, but there were major problems on cost and scale; nuclear could already be competitive, but there were still difficult public perception problems; reduction of demand through energy efficiency and price needed concerted government action; even using all these factors, carbon reduction must be a significant part of the solution. But was it likely to happen? No large-scale plants had yet been built; yet to meet CO_2 targets 4 to 5,000 such plants needed to be built over the next 50 years. The problems were not primarily technological, but included agreement on final deposit of the gas and regulatory and financial issues. There was experience of storing it in aquifers, of using it for enhanced oil recovery and for binding it to make products such as olivine. But these solutions could not apply everywhere. The formidable problems of cost, both in terms of additional capital and running costs, and loss of energy output, and regulatory structure must be met. The pioneers of such technologies ran considerable risks; government needed to consider how these risks could be mitigated. In short, he feared that the CO_2

content of the atmosphere would continue to rise. If his fears were justified the world would have to deal with the grave consequences of climate change

A number of questions were raised in the ensuing discussion about the feasibility and cost of fitting equipment for carbon abatement to power stations. If governments were serious about reducing CO_2 emissions, this meant retrofitting existing power stations as well as equipping new ones. The costs were so large that such a policy was not practicable. Even if CATS were used only on new stations, there were serious problems. First, the power output would be reduced by some 10 to 20%, the technology had not been proven on a large scale, (the experience where it had been tried was not encouraging), and the private sector would not undertake the risk of doing the work without some insurance against the risk of installing what one member described as " A technology too far". But other members thought this view was too pessimistic. They pointed at the enormous cost reductions, which normally followed the introduction of a new technology. There was no reason why this should not happen in this case. The crucial factor was the fiscal regime under which generators operated. If the price of carbon were set, for example, at $50/tonne, then the commercial requirement to minimise such costs would bring forward appropriate technical solutions. But, as speakers had pointed out, carbon reduction, which was meaningful had to take place in an international context. First, carbon reduction by the UK and Norway, or even by the EU as a whole, was only nibbling at the edge of the problem, given the much greater emissions from other countries; second, individual countries would have to watch their competitiveness; they could not allow their energy costs to become significantly greater than their rivals; third, no real progress on both energy efficiency and carbon reduction techniques could be made without a full exchange of knowledge and best practice.

It was clear that the amount of R&D being undertaken was, even although it had increased, was still insufficient to bring CATS quickly to the market. What were the priorities for future work? It was suggested that integrating the various components into a system which would lead through energy efficiency, carbon abatement to final disposal was a key issue, Some of the components were understood, but if the best use of resources was to be found, the cycle must be viewed as a whole. Was there any incentive for doing this? Inevitably the future contained a mixture of energy sources, each of which would have different cost and benefit structures, and governments would not wish to try and select favourites, but would seek the market to decide between them.

There was concern that we were not facing up to the problems caused by increasing energy demand. Increased efficiencies in generation and transport had been negated by increasing use, and there was no sign of CO_2 reductions coming through globally. China and India and SE Asia economies were expanding energy use very rapidly, and there was no incentive for them to concentrate on carbon reduction, as they were outside the Kyoto protocol. But this view was challenged. The Chinese were well aware that they lived in a world which was threatened by climate change, and they had analysed the problems of carbon reduction with as much insight as the West; the Indians knew well about climate change problems because of their dependence on the monsoon. They did not need lectures from us; they needed help in developing technologies which would enable them to obtain growth without damaging the environment. But knowledge transfer raised difficult questions about intellectual property; it would be naïve to suppose that companies would willingly communicate financially valuable technical information. It was important that rich developing countries, such as China, if they were serious about carbon abatement, understood that, for at any rate some of that help they might get, they would have to pay.

Broader issues were also raised in the discussion. Were we in danger of spending large resources on Carbon Abatement, when other fuel sources – renewables and nuclear might rapidly overtake fossil fuels? Could we be sure that sequestration was safe and permanent? Could coal gasification become a globally employed technique? What were the comparative costs of biomass fuel to fossil fuel? How do we ensure an adequate supply of persons wanting to do the scientific and technical work needed, and man the rigs and plants that must be built? Were the various engineering and other professional bodies working closely enough together to meet the professional challenges and train staff? Finally, had the Government got the right organisation for dealing with energy issues? Was there a case for reviving the Department of Energy?

Sir Geoffrey Chipperfield KCB

The presentations from two of the speakers are available on our web site - www.foundation.org.uk .

Background information:

Review of the feasibility of carbon dioxide capture and storage in the UK
www.dti.gov.uk/energy/coal/cfft/co2capture/review.pdf

DTI Energy Team
www.dti.gov.uk/energy/about.shtml

Institute for Energy Technology Group, Norway (IFE)
www.ife.no/index_html-en

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