THE FOUNDATION FOR SCIENCE AND TECHNOLOGY

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DINNER/DISCUSSION SUMMARY

The contribution of technological innovation to meeting energy policy targets

Held at The Royal Society on 5th November, 2008

The Foundation is grateful to the Engineering and Physical Sciences Research Council, the Engineering and Technology Board and Shell UK Limited for supporting this meeting.

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

Speakers: **Dr David Clarke**
Chief Executive, Energy Technologies Institute
Dr Mark Henstridge
Director, Group Economics, BP
Mr Willy Rickett
Director General, Energy, Department of Energy and Climate Change

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DR CLARKE said that the mission of the Energy Technologies Institute (ETI) was to accelerate the deployment of responses to the challenge of climate change. ETI was a partnership between Government and major industrial firms with 50/50 funding. Its aim was to develop all low carbon energy systems by bringing together skills, better market access and improved supply chains. CO_2 reductions, affordability and security were interlinked and it would be insufficient if each were looked at in isolation. Key challenges were renewable (particularly offshore wind), distributed energy, carbon capture and storage (CCS), and above all, systems modelling. Although it was transport, power and heat which produced emissions, their reduction depended on substantial investment in infrastructure. Although the global matrix of possible CO_2 reductions showed the theoretical importance of solar energy, in practice, for the UK, systems modelling showed greater reductions coming from renewables and nuclear. ETI gave priority to areas such as offshore wind (particularly turbine design) and transport - the Plug In Hybrid Vehicle (PIHV). ETI's emphasis was on collaboration with partners, introducing new partners, focusing on specific areas, identifying and accepting risk, and driving technology from concept to delivery.

DR HENSTRIDGE outlined the conclusions from BP's annual Statistical Review of World Energy, the global trends in fuel consumption and mix – 35 per cent for oil (and declining); 23 per cent for gas (and increasing) and 28 per cent for coal (increasing, notably in China). He noted the relationship between GDP and energy use and consumption, and the marked differences in trends between OECD and non-OECD countries. Energy use was strongly affected by price, where market pricing was allowed to work and where taxes were small - energy use in the US, and other OECD states had declined but there were notable increases in other countries. Global supply of oil was no problem but realizing it through access to technology and investment was. Mature fields, such as in the North Sea were declining, but new opportunities for development in Russia were available. Global trading would mean that markets and prices for both gas and coal would become more integrated. At present, the impact of renewables was small, but would grow. Priority should be given to maximizing recovery from reservoirs, developing conversion technologies (gas or coal to oil), and low carbon technologies (renewables). Lessons from the survey demonstrated the linkage between economic growth and energy intensity; the importance of consumption in non-OECD countries; the effect of price on usage (where permitted); the constrained nature of oil supplies and markets; and the more open markets and global integration of gas.

MR RICKETT said that the creation of the new Department of Energy and Climate Change (DECC) was a recognition of the changed energy scene; the importance of security of supply and the need to respond urgently to climate change. Setting new targets across the field and demonstrating how they could be met should lead, he hoped, to a new Energy White Paper in 2009. Meanwhile, he outlined the problems the country faced in meeting existing targets, such as doubling the rate of energy efficiency in dwellings (which raised the difficult technical problems of how to deal with the existing housing stock) as well as in appliances and vehicles; moving heat and power towards low carbon technologies; and ensuring that financial pressures did not derail environmental objectives. The department already had some policies directed to power sources, such as those on nuclear power (sitting of stations, the merger of British Energy and EDF, and waste), and on Carbon Capture and Storage (the CCS demonstration project) and renewables but more needed to be done. Innovation was needed to develop new means of electrical storage, the smart grid, biotechnology and other generation options. His concern was whether there were too many bodies involved, whether transformational technologies were being overlooked, and the gap between demonstration and market ("the valley of death") too large. Government had a major role to play in giving leadership; promoting international collaboration; supporting industry and research through funding and regulation; and developing stable long term policies which linked supply and demand.

A major theme in the following discussion was the relationship between the price of oil, usage of carbon fuels, and the development of low carbon technologies. The oil price had recently halved, which was of great benefit, in particular, to non-OECD countries, which were where the fastest growth in energy use was occurring. Even in OECD countries, such as the US and UK, there would be pressure, because of the financial crisis, to reduce taxes on fuel so that consumer prices would remain low. This must effect investment in renewables, and the opportunities which had been seen for export of technologies to developing countries. But speakers suggested that oil prices would inevitably fluctuate; it was the long term trend that was important for investment; and because of the constrained nature of the oil market, there would, in the long term be a steady rise in the price of oil. The missing factor in the discussion had been the effect of putting a price on carbon. Renewable investment would depend not only on the price of carbon fuels, but also on whether carbon emissions carried a cost. It was here that the EU negotiations over targets and the European Trading Scheme (ETS) were crucial. They would be extremely difficult, because of the reliance of

some member states on coal (the "coal 8"); and it was important to know whether, if these negotiations failed to deliver a stable and effective policy, the UK would be prepared to act on its own. But the UK on its own was a minuscule participant in global energy problems, and to act on its own would merely give other countries a competitive advantage. Even if the EU developed an effective ETS and carbon price, it would be ineffective globally unless such states as China and the US joined into a global carbon policy, which would inevitably mean that low carbon technologies must be employed globally. This, in itself, raised the difficult problem of intellectual property rights, and transfers across countries. But there must be recognition that raising the price of carbon fuels (either through failing to invest in new sources and technologies or through carbon pricing) will affect the global economy and reduce growth. While few doubted that carbon reductions to meet the IEA's forecasts for what reductions are needed to avoid rising global temperatures, could theoretically be made, it was rash to assume that nations would agree to the necessary measures.

Speakers endorsed Mr Rickett's belief in the importance of Government producing stable long term policies. But, if industry were to invest and cooperate, it must believe that polices were stable. The record had not been good - notably on tax and subsidies - and needed to be improved. Other countries - Spain and France, for example - had been more successful. There was concern that the emphasis in both the DECC and the ETI on focusing on certain areas and projects might lead to the policy of trying to choose winners. Innovation rarely came from large companies and research institutions focusing on areas where they already had sufficient knowledge to think of improvements. Focusing meant, also, exclusion, and the exclusions were likely to be include the transformational technologies which Mr Rickett would like to see, and small companies who found the bureaucracy and regulatory hassle ("micromanagement") in dealing with grants and investment from Government too difficult to face. But they were the companies which innovated. There would always be a tension between what academics and researchers would like to do and the Government's duty to see that taxpayer's money was spent on projects which showed public benefit in an ascertainable future. The Research Councils sought to square this circle by ensuring that academics were involved in the funding process, and seeing that there were some "blue sky" funding which might lead to transformational technologies. While the ETI's aim of attracting further partners from smaller companies was desirable, it was difficult to see how they could be attracted if they could be required to share their intellectual property with big companies who were already partners.

A further theme was the scale, cost, and effects of renewables. Mr Obama's promise to spend $150 billion on renewables was noted; were the UK efforts related to this scale of activity? The effect of such spending could have drawbacks in creating competition for components of renewables which could lead to price increases. The problems in increasing the output of renewables lay more in the scarcity of manufacturing resources than in the need to develop new technologies. It had already been noted that there was a worrying gap between the demonstration that a technology was feasible and the delivery into the market place ("the valley of death"). In some cases the gap might be due to lack of financing, but in others it could be due to shortage of manufacturing capacity, and reluctance to invest in capacity. In both cases the fundamental problem was risk and the energy industries were notoriously conservative. Companies could not afford to take a risk without strong financial backing and Government officials were concerned about public accountability. It was in this area that the government could make a significant difference. In some cases - e.g. offshore wind - the technology was there, but targets were unlikely to be met because of UK manufacturing capacity. It might be that there was global capacity, but other countries would also wish to access it.

Finally, does the UK appreciate that to install the low carbon sources and develop the infrastructure to deliver them to the consumer will require huge investment and the deployment of large numbers of skilled engineers and workforce? If offshore wind, for example, is to be a major renewable source, it will need a major realignment of the grid to take power from the North West to the South East, and substantial investment in port and marine facilities. The skills problem is particularly difficult. The problem is not a shortage of engineers coming out of university, but of engineers with specific skills in specific sectors (such as nuclear) and high grade vocational workers such as welders. Fortunately, the number of mathematics and science students seems to be increasing, and with the lures of the financial sector as employers rapidly decreasing, there was hope for the future. But time was of the essence; more needed to be done more quickly. More students could be persuaded to come into the energy sector, if it were made clearer that this was an exciting and important area for long term careers and work.

Sir Geoffrey Chipperfield KCB

Presentations from the meeting are on the Foundation web site at www.foundation.org.uk.

Web links:
BP Statistical Review of World Energy
www.bp.com/statisticalreview
Carbon Trust
www.carbontrust.co.uk
Caterpillar
www.unitedkingdom.cat.com
Department of Energy and Climate Change
www.decc.gov.uk
Economic and Social Research Council
www.esrc.ac.uk
EDF Energy
www.edfenergy.com
Energy Research Partnership
www.energyresearchpartnership.co.uk
Engineering and Technology Board
www.etechb.com
E.ON UK
www.eon-uk.com
Engineering and Physical Sciences Research Council
www.epsrc.ac.uk
Energy Saving Trust
www.energysavingtrust.org.uk
The Energy Technologies Institute
www.energytechnologies.co.uk
The Foundation for Science and Technology
www.foundation.org.uk
International Energy Agency (IEA)
www.iea.org
National Endowment for Science, Technology and the Arts
www.nesta.org.uk
Organisation for Economic Co-operation and Development (OECD)
www.oecd.org
Rolls-Royce plc
www.rolls-royce.com
Science and Technology Facilities Council
www.stfc.ac.uk
Shell UK Limited
www.shell.com
Technology Strategy Board
www.innovateuk.org
UK Energy Research Centre
www.ukerc.ac.uk

The Carbon Trust will showcase carbon reducing technology start-ups and projects at the London Stock Exchange on 25th November. Interested companies should contact the events team at events_team@carbontrust.co.uk or telephone 0845 136 0103.