THE FOUNDATION FOR SCIENCE AND TECHNOLOGY

DINNER/DISCUSSION SUMMARY

Is there a viable future for biofuels in the UK?

Held at The Royal Society on 6th April, 2011

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

Speakers: **Dr Bernie Bulkin**
Chair, Office for Renewable Energy Deployment (ORED), Department of Energy and Climate Change
James Primrose
Global Strategy Manager, BP Biofuels
Sam Cockerill
Business Development Manager, Ensus
Professor Douglas Kell
Chief Executive, Biotechnology and Biological Sciences Research Council

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DR BULKIN outlined the role of biomass in achieving the 15% renewables target by 2020. The 2009 Renewable Energy Strategy had shown it to be achievable with 50% coming from biomass, in transport, electricity production and heating. But this was a top down exercise: was there a plan for achieving it, which would allow one to track progress and identify problems? A subsequent bottom up exercise focussed on individual technologies, setting out high, low and central estimates, and examining possible barriers had also shown the target to be achievable - indeed the central estimate was better than the target but there was a 30% range up or down. Biomass was competitive for electricity production with cofiring; heat technologies were also competitive, if efforts were concentrated on the non-domestic sector. In transport, the outlook was clear until 2014, but decisions were needed now on choices about what routes to pursue thereafter. The choices were: rely on bio diesel and bioethanol (technically safe but with sustainability problems); betting on new technologies becoming commercialised in time (risky); going all out for biomass in specific areas (e.g. aviation, shipping); or relying on electrical vehicles (requiring an aggressive strategy for vehicles and low carbon electricity). Factors determining the choice included, jobs, sustainability and waste.

MR PRIMROSE outlined the global perspective on biofuels. They formed 5% of all transport fuel supplies - the fourth largest after the oil producers. The attraction they had was that , as liquid fuels, they could be used in existing vehicles either alone or in combination with petroleum. They were not the answer on their own, they would be effective solutions only with maximum use of hybridization. The technical risk of using biofuels was much less than relying on developing electrical car and low carbon electricity, and using gases or LNG. BP had established its biofuels unit in 2006 and it now had three major components. These were (1) a milling operation for sugar cane in Brazil (2) US processing units using cellulosic sources; and (3) a major research effort to improve molecular structure of biofuel sources to make the product more comparable with petrol and delivering improved yields. The drivers for BP were securing low costs, low carbon emissions, scalable technologies and sustainability.

MR COCKERILL explained the role, function and technology of Ensus. This was a company set up in 2006 to respond to concerns about energy security and climate change. Biofuels achieved a 70% savings on CO_2 emissions compared with petrol. It had made a £300m investment in a major plant in the North East, creating 2,000 jobs. It was a world scale process based on a UK sourced wheat feed input and it produced sufficient biofuel to meet half the UK demand, and was the largest producer of animal feed. He explained the fermentation process which turned the starch and sugars in the feedstock into bioethanol and used CO_2 emissions for other purposes (e.g. fizzy drinks). The residue is high protein animal food. This is the critical function for sustainability; it adds to the EU food supply by producing a greener food chain. One fifth of global greenhouse gas emissions come from meat production, a large element from animal food, much of which comes from soybeans imported from South America, with indirect results on tropical forest destruction. There was no problem in ensuring that there would be a sufficient supply of grain for the operation of the plant. The benefits of the Ensus process were that it was an immediate and sustainable contribution to the UK and EU biofuel targets; it improved security both for energy and food sources; and it provided a platform for development of second generation biofuel sources, such as grasses and algae.

PROFESSOR KELL said that historically CO_2 had been sequestered by plants. We now needed to use plants to sequester CO_2 in the soil and reduce emissions, through biofuel use. The two went hand in hand. In the UK there was a sufficiency of land; even if all environmentally sensitive areas such as National Parks were excluded and only grade 3 and 4 agricultural land used, there were still 3.1m hectares of land available, although with variable regional yields. Liquid biofuels enabled existing vehicle engines to be modified for use. Crucial work was needed to increase yield and genomic science would be the driver in fields such as biomass growth, bio composition, biomass deconstruction and fermentation. The science was available to take development further, but the most difficult problem was how to incentivize farmers to turn their fields over to biomass production. Profitability through increased yields, effective marketing and sensible regulation would help, but much more needed to be done.

The principal themes in the following discussion were the economics of biofuels, the public acceptance of their use and the difficulty of persuading farmers and land users to change their crops for those for biofuel use. There was little dispute about the advantages of biofuels for CO_2 reduction, but concern that presenters had been over optimistic about the chances of obtaining the scale of use that had been predicted. They had insufficiently stressed the possible snags and trip wires (indeed one speaker commented that the presentations reminded him of double glazing salesmen). It was clear that biofuels were cheaper renewables than, say, offshore wind or photovoltaic, but that was insufficient to bring forward the investment needed to bring about the change required. Speakers noted with particular interest the Ensus process, which coupled bioethanol production with high protein animal feed, thus meeting two markets, which might often peak at different times. A great

advantage of this process was that it used UK wheat production and met farmers' requirements. So one might have expected that investors would have wanted to fund similar types of process. But they had not yet shown any sign of being willing to do so. The lesson was clear - until entrepreneurs could show convincingly that these plants were profitable within a set time period, investment would not happen. It was true that such plants were being built in China, but that was an authoritarian state run economy.

Speakers agreed with the presenters that hybridization of liquid fuels was the most likely way forward, given the risks of other routes and the importance of being able to retrofit the existing car fleet. But public acceptances of such fuels was a major issue. It would not be easy to persuade the public that they would get the same performance that they were used to from their cars, with the same reliability, as from existing fuels. The German experience was noted - a major effort to persuade the public to use hybridised fuel had collapsed amidst media storm when certain defects had appeared. The public acceptance of any biofuel had hence been undermined. The most forceful incentive for public acceptance would be high oil prices, and a conviction that they would stay high; the public would be unlikely to respond to targets which had been formulated in response to climate change fears; scientists should not overestimate the public interest in the concerns that moved them.

If farmers were to commit to growing crops for biofuel, they would need to have safeguards against the dangers of committing to a certain crop, which would then be overtaken by technical changes which necessitated a different crop, or different means of production. The presenters had laid stress on the wide scope there was for increasing yields, with better seeds, giving increased protection against diseases, and less demand for fertilizers and water. Others had warned, however, about the dangers of extrapolating past increases in yield in forecasting the future, particularly at the global level. There would still be many water shortages, and continuing efforts to restrict the use of pesticides. Assumptions about making use of marginally productive land, ignored the large populations for whom it was an essential element for survival. On the other hand, the total of land in agricultural use had fallen; population increase took place in cities and there was significant amount of land (e.g. in eastern Europe) which could be brought into productive use. Doubts still remained about the effects of monocultures. Whatever incentives were put in place there was the danger of perverse incentives, leading to undesirable effects. Environmentalists would resist crop change, if it affected landscape, and one could never forecast how the gradient of land use change would develop.

The discussion and presentations had concentrated on the 2020 targets, but it was important to look beyond them to 2050. Targets for 2050 assumed that there would be a 80% reduction in CO_2 emissions. Would meeting the 2020 targets provide a path to 2050, given that the world population was expected to rise by one third? Perhaps population growth would slow thereafter, and by itself would spur agricultural productivity which had not been under significant pressure in recent years. But, perhaps more importantly we should be looking at the 2020 and 2050 targets in a much broader sense. We should be considering their effect on biodiversity, on land rights and tenure, on public demand and population spread, and on the regulations needed to achieve results. A policy environment which considered all these factors would be the only way to secure their achievement. Meanwhile we should perhaps, view biofuels as an interim or transitory fuel source, which should form part of a portfolio of fuel sources, which could form a platform for development of technologies. We should also seek to get a better public understanding of the difference between "good" and "bad" biofuels. But how to do this, and who should attempt to do so was unclear.

The message from the discussion was that the answer to the question posed was that there could be a viable future for biofuels in the UK but that there would not necessarily would be. There were significant problems in the path of meeting biofuel targets, although all supported the need to press ahead with working to achieve them. The major obstacles were achieving the investment necessary; securing a stable and inclusive regulatory framework; and working hard to persuade the public that biofuels were both safe, reliable, economic and essential if climate change challenges were to be met.

Sir Geoffrey Chipperfield KCB

Biotechnology and Biological Sciences Research Council
www.bbsrc.ac.uk

BP Biofuels
www.bp.com/biofuels

Department of Energy and Climate Change
www.decc.gov.uk

Ensus
www.ensusgroup.com

The Foundation for Science and Technology
www.foundation.org.uk

Nuffield Council on Bioethics
www.nuffieldbioethics.org/sites/default/files/Biofuels_ethical_issues_FULL%20REPORT.pdf
and
www.nuffieldbioethics.org/news/current-biofuels-policies-are-unethical-says-report

Office for Renewable Energy Deployment (ORED), Department of Energy and Climate Change
www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/ored/ored.aspx

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