Oral evidence

Taken before the Environment, Food and Rural Affairs Committee

on Wednesday 1 March 2006

Members present:

Mr Michael Jack, in the Chair

Mr David Drew	Mrs Madeleine Moon
Patrick Hall	Mr Jamie Reed
Lynne Jones	Sir Peter Soulsby
Daniel Kawczynski	David Taylor
David Lepper	Mr Shailesh Vara

Memorandum submitted by National Farmers' Union (Bio 14)

EXECUTIVE SUMMARY

The NFU believes that renewable energy sources should be pursued in the UK and Europe to reduce reliance on imported fuels, and reduce carbon and greenhouse gas emissions to help tackle the effects of climate change.

- Bioenergy can and must play a full part in a diverse range of renewable energy options in the UK to help meet carbon saving targets. Biomass and biofuels show significant carbon and energy savings compared to fossil fuels.
- Biomass feedstock for energy can be domestically supplied through:
  - Dedicated biomass crops.
  - Utilisation of waste biomass (animal waste, wood, etc).
- Development of a domestic bioenergy industry will:
  - Increase domestic fuel security as fossil fuel depletes and becomes more expensive.
  - Help fulfil UK commitments to tackle climate change using UK resources rather than offsetting our responsibilities to foreign countries.
  - Provide alternative markets and a much needed boost for declining North Sea refineries, UK agriculture and the rural economy.
- Bioenergy technology is in its infancy but given support, future technological advances will show increased efficiency of carbon saving and economics in production and processing.
- The domestic bioenergy industry needs Government support and a clear long term strategy for development to give confidence and attract investment.
- Development of the domestic industry will provide the framework to utilise the energy potential of waste biomass and contribute to reducing waste problems.
- UK agriculture can provide renewable energy *and* maintain food production.

What is the real scope for biomass and biofuels to contribute to tackling climate change?

1. The renewable energy sources of biomass and biofuels can play a major role in tackling climate change by replacing fossil fuels in the production of heat, electricity, transport fuel and other products, thus reducing carbon emissions. Carbon sequestration by crops during growth means that these fuels are close to carbon neutral (and hypothetically carbon positive). The exact carbon savings achievable by use of biomass and biofuels varies according to feedstock, production and processing methods. Waste and by-product sources also have great potential. The Biomass Task Force highlighted the potential of 5–6 million tonnes of waste wood to contribute to UK energy production. There is also a potential gain from utilising organic and animal wastes through anaerobic digestion technologies.

2. Biomass can be used to generate electricity from many organic forms, such as wood, energy crops, animal waste. Currently the main market is through co-firing in coal-fired power stations which reduces carbon emissions associated with electricity generation. The extra energy efficiency possible through capturing heat as well as power offers greater potential with biomass-fuelled combined heat and power (CHP) stations offering real renewable prospects, particularly in energy deficient and biomass resource-rich

regions. Opportunities range from small scale heating systems (such as hospitals and schools), to fully integrated combined heat and power stations, with district heating for residential, industrial and commercial sectors in the large new developments planned by government up to 2020.

3. The feedstock for biomass fuelled CHP generators can come from waste products as well as dedicated energy crops such as short rotation coppice (SRC) and miscanthus. UK farmers are well equipped and capable of providing these to meet the demand as well as providing useful biomass through waste by-products such as poultry litter, straw and wood.

4. Life cycle analysis work carried out on biofuels identifies greenhouse gas savings of around 60% compared with fossil fuels. Given sufficient support in research and development, technological advances will provide even greater savings in the future (eg through increased efficiency and new plant breeding). One of the great advantages of biofuels is that the crops used as feedstock are the traditional annual crops that UK farmers are used to growing (wheat, sugar beet, oilseed rape). Feedstock for biofuel industries in the UK can be provided easily by existing UK farmers without the need for new specialist machinery, skills or knowledge.

5. New uses of plant-derived materials are able to substitute fossil fuel based products such as plastics, polymers, paints and pens. These are real opportunities for the UK biotechnology industry developing expertise in these areas and providing further carbon savings. This sector will benefit greatly from the development of biorefineries, allowing extraction of a wider range of useful products from biomass feedstock.

What proportion of the UK's energy and transport fuel needs could they provide?

6. The Biomass Task Force estimated that 1 million hectares of agricultural land could be available for non-food uses in general. This along with an estimated 5–6 million tonnes of wood waste and vast unused potential of animal and other organic farm wastes could provide a significant proportion of UK energy needs. It is hard to put a specific figure on the potential of energy production because of the various combinations and production methods available.

7. For biofuels, the NFU calculates that UK farming could meet the 5% Renewable Transport Fuel Obligation (RTFO) inclusion target (for petrol 2010) using the UK exportable surplus of wheat. Using a high estimate for 5% of the 2010 petrol market, 1.2 billion litres of bioethanol would be required. The UK exportable wheat surplus (average 2.9 million tonnes) could produce 1.267 billion litres of bioethanol. This is without the planned 70 million litres per annum from British Sugar's Wissington plant, or use of set-aside land. This demonstrates the ability of UK agriculture to meet demand and provide for further increases post 2010. This ability will increase with new technology, specific energy plant varieties and increased production efficiency of wheat and sugar beet.

8. NFU calculations also demonstrate that the 5% RTFO target for biodiesel could be met by UK feedstock. Diesel consumption estimates for 2010 suggest the requirement would be 1.15–1.35 billion litres. If this were to be produced solely from oilseed rape (OSR) this would require 2.4–2.8 million tonnes (680–800,000 ha). Current UK OSR area of 557,000 ha and set-aside area of 560,000 ha could easily provide this. This would impact on OSR grown for food uses and would suggest a need for a significant increase in area grown if the biodiesel demand was to be met solely from domestic supplies. There is still great potential for the increased use of waste biomass resources in biodiesel production and this will develop as the market and technology increase the efficiency of production (current and planned production approximately 70 million litres per annum).

9. In practice the 5% RTFO does not have to be evenly split between diesel and petrol, and there is scope for the introduction of Flex-Fuel Vehicles (FFV) and E85 fuel to increase the contribution of bioethanol over biodiesel. These two examples illustrate the potential of UK agriculture to more than meet the 2010 RTFO requirement and beyond, as the obligation level increases and future technology allows greater use of organic waste and by-product sources in the process.

How cost-effective are biomass and biofuels in comparison with other sources of renewable energy?

10. Biomass and biofuels can cover a large range of products. Feedstock production methods, transportation and efficiency of energy conversion all have a bearing on cost-effectiveness. The biomass and biofuels industries in the UK use relatively new technologies and have received little research and development investment compared with fossil fuels and other renewable technologies. Great advances in efficiency and economics can be made all along the biomass and biofuel production chain given sufficient support and investment. The development of bio-refineries, making use of all parts of the biomass feedstock, will greatly improve the efficiency of production.

11. Current methods for generating electricity from biomass show extraction efficiency of approximately 30%. However when the heat generated is also captured this rises to 80–90%. Transport costs for the bulky feedstock can impact significantly on cost-effectiveness and energy efficiency, but if these are controlled, CHP from biomass can be very efficient.

12. Both biomass and biofuels provide the insurance of reliability of supply with the ability to store the fuel and provide energy when required. This is a major advantage over other renewable energy sources which suffer from intermittent supply. This should be taken into account when comparing cost-effectiveness.

13. It is important to tackle carbon emissions in all sectors of energy use. Transport energy demand is the fastest growing carbon and greenhouse gas emitter. This sector has a particular need to exploit renewable energy sources. Although the energy efficiency conversion of biofuels is not as impressive as some other renewables, they are readily usable in pre-existing vehicles, making wide scale usage easy.

How do biofuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?

14. Life cycle analysis (LCA) of carbon savings from biofuels and biomass compared to fossil fuels vary depending on many factors as previously mentioned. However, there have been studies that show considerable carbon savings of "field to forecourt" biofuel life cycles compared with "well to tank" fossil fuels.

15. Useful indicative values for life cycle carbon savings compared to fossil fuels are 53% biodiesel from rape and 64% bioethanol from wheat.[1]

16. There is also considerable scope to improve these efficiencies as the industry matures and technological advances in energy crop production, agronomy and processing occur, given sufficient funding and encouragement. It is believed that up to 80% reduction of greenhouse gas emissions of biofuels compared to petrol and diesel could be achievable in the future.[2]

17. Biorefineries utilising CHP fuelled by by-products offer net carbon savings of over 100%.

Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?

18. The UK leads the way in accreditation and environmental schemes. The adoption of voluntary assurance schemes along with recent cross compliance environmental conditions has resulted in many LCA improvements. Increased costs of production associated with increasing energy prices has further encouraged targeted and lower inputs. Further carbon-saving will be possible as new technology emerges (para 26).

19. Key elements required in a carbon accreditation scheme:

- Transparency—Carbon accreditation must stand up to scrutiny, providing robust values and clear methodology.
- Compatibility—It must be applicable throughout Europe and compare with world imports.
- Practicality—Whilst a robust system is needed, it must not be overly restrictive on farmers and should build upon systems already in place, rather than duplicating current assurance schemes eg Assured Combinable Crops Scheme (ACCS) which covers over 85% of UK arable production.
- A scheme should build upon research and systems that are already developed, such as Central Science Laboratories (CSL), Home Grown Cereals Authority (HGCA) and Imperial College work on Life Cycle Analysis & Carbon Accreditation. This needs to include independent LCA for fossil fuels to give an accurate comparison.
- Inclusion of a banding system to reward the most efficiently produced biofuels.
- Biodiversity and sustainability element—Biodiversity can be a contentious and costly element to measure. A biodiversity element should build upon existing biodiversity and environmental protection schemes that already exist across EU agriculture (involvement in cross compliance, ELS, HLS) and equivalents in other countries.

What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and biofuels?

20. UK and EU support is crucial in increasing the demand for and production of biomass and biofuels. Both are developing markets that have to compete with large well-established energy industries with well-developed infrastructure and investment funding behind them.

21. Long term market stability and strategic planning is required in order to gain the investment in infrastructure needed in a new industry. EU support for biomass in the recently released Biomass Action Plan and the statements that developing the EU biomass market is to be a key concern for the current

[1] Turley, McKay and Boatman (2005) "Environmental impacts of cereal and oilseed rape cropping in the UK and assessment of the potential impacts arising from cultivation for liquid biofuel production" Research Review 54, Central Science Laboratory.

[2] Woods, J and Bauen, A. Technology Status Review and Carbon Abatement Potential of Renewable Transport Fuels (RTF) in the UK. Anonymous. DTI; AEAT. B/U2/00785/REP URN 03/982:1–150, 2003.

Austrian European Presidency gives a strong positive signal to the market. The UK Government must follow this lead, declaring its intentions on long term investment in biomass as part of its renewable energy policy in response to the Biomass Task Force report and in conjunction with the 2006 Energy Review.

22. English Rural Development Agencies and the Devolved Governments have an important role to play in developing holistic regional renewable energy strategies, identifying suitable bioenergy sites and helping foster markets through planning regulations and public procurement.

23. Biomass for electricity and heat generation requires EU and UK signals that will create long term market confidence and bring about investment in infrastructure. Biomass crops are generally a long term commitment to the farmer—SRC has high establishment costs and needs to be grown for several years before the economic returns become viable. The grant support for energy crops that are currently available need to remain to help cover some of the establishment and market development costs.

24. The introduction of the RTFO provided a great boost to the biofuels industry and some of the stability that the market has been searching for. This must be reinforced with long term commitments and specific targets set out in the design of the RTFO announced as soon as possible, referring to the 2006 Budget that will set the buy-out price and commitment to duty rebate of 20p/l. A clear long term biofuels strategy that sets out the fiscal policy for at least five years and shows how the UK will progress onwards from 5% renewable fuel in 2010 is needed. Failure to provide a long term vision will increase the risk for investors and reduce the chance of a domestic biofuels industry developing.

25. The Government needs to remove some of the current barriers to the biomass industry such as the regulation surrounding the use of waste products in energy generation and the process involved with connection to and selling electricity to the national grid.

What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?

26. Bioenergy production is a relatively new technology and will benefit from further dedicated research and development. New plant varieties, genetics and husbandry for dedicated energy crops that are suitable for our climate are needed.

27. Bioenergy technologies will require long term market signals that give confidence that the industry is viable and worth serious investment in research and development. If there are suggestions that Government is not fully backing bioenergy, investment in future technology may reduce or will concentrate in those technologies or countries where the most commercial gain can be achieved. The UK expertise in oil production should be promoted in these new bioenergy fields rather than lost as North Sea oil declines.

What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?

28. An increase in energy crops (as with any land use change) will impact on biodiversity. Many variables are involved. We can make assumptions as to the likely effects and should look to minimise negative impacts and maximise the environmental benefits that energy crops can deliver. The overall benefits of carbon sequestration and reduction of climate change gases will be of great benefit to the environment and biodiversity in general.

29. The diversity of habitats created through mixed farming has helped to shape UK farmland biodiversity. Following the implementation of CAP reform and the Single Farm Payment (SFP), there is a real danger that significant areas will be left fallow since SFP is not dependent on production. The introduction of energy cropping will help to retain the diversity of cultivated habitats across UK farmland, offering alternative vegetation structure and variety in field operations and growing seasons. Specific schemes and environmental protection measures are in place in both the UK and throughout Europe to address biodiversity issues and these will work just as well in energy crops as in food crops.

30. Biofuel crops will be similar to those currently grown throughout Europe (wheat, OSR, sugar beet). In the UK most of the feedstock required to meet the RTFO can be achieved by exploiting the current exportable surpluses and use of some set-aside land. Quality specification will be lower than for food production. This should allow reduced inputs, lower energy requirements, reduced risk of diffuse pollution and potentially increased feed sources for wildlife. Long term crops such as those specifically grown for biomass will provide a stable habitat, reduced risk of soil erosion and associated diffuse pollution problems.

31. Production of food crops will not be adversely affected; movement into energy cropping will remove some of the UK's exportable surplus and will help to create a more balanced market. The crops used for biofuels are mainly dual purpose and so can be used for fuel or food; this flexibility will help to balance the supply of both markets. New energy crop markets will help to maintain the capability of UK agriculture and ensure the potential of national food security is not compromised.

Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?

32. A domestically-fed bioenergy industry will have great benefits for UK and the EU. Biofuel and biomass production offers an opportunity to provide feedstock for renewable fuel, utilising existing knowledge, skills and equipment. To pass up on this opportunity, allowing the UK bioenergy market to be dominated by imports would be a major mistake.

33. In the initial stages of bioenergy development, imports of both biomass feedstock and biofuels may be used in the UK. It is important that any imports are assessed for carbon saving credentials and sustainability (para 19). There is a danger that the UK bioenergy market could be fed by imports of cheap, environmentally-damaging biomass. If the home biomass market is not encouraged and infrastructure developed at this stage, this scenario will become a reality and hard to stop without a significant domestic supply. Foreign biofuel markets benefiting from significant economies of scale and market presence could easily stifle UK production if we miss the boat.

What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?

34. The NFU is fully supportive of developing biomass markets to make more use of waste products and off-cuts. In this way waste products can be incorporated as substitute feedstock as necessary without building up capacity to produce fuels from a limited feedstock.

35. The most efficient use of waste resources will be to develop bioenergy plants (small or large scale) in close proximity to waste and by-product sources (developing CHP plants close to timber yards etc).

36. More use could be made of animal wastes and other "wet" biomass material. Anaerobic digestion offers a potential solution to making energy from animal wastes. This technology needs to be supported and incentives introduced to encourage the use of such systems.

37. The regulations that surround waste management are often restrictive in the use of waste for energy production. We understand that the European Commission is currently considering the revision of the Waste Framework Directive. Amongst the proposals for change, is the clarification of when various materials are no longer considered to be waste. We understand that it is proposed that there are particular exclusions for some materials. Many biomass materials are currently defined as waste, and when treated these become subject to controls set out within the Waste Framework Directive and the Waste Incineration Directive.

What lessons can be learned from other countries' experience in the production and use of bioenergy?

38. The countries that have developed the most successful biomass and biofuel industries have mainly benefited from government adopting long term support strategies, giving investors and producers confidence to supply the market.

39. The German government has consistently supported biofuels with financial incentives. The full duty concession for biodiesel has raised confidence in the industry and attracted investment into the country. Germany has seen biodiesel production increase to an estimated 1.2 million tonnes in 2004 (1.76% of total transport diesel) and investment continues in crushing and processing plants in the country.

40. Brazil and the USA have both developed significant bioethanol industries through use of tax advantages and national programmes in response to the 1970's OPEC oil crisis and the fuel security concerns. Brazil is the largest producer of bioethanol today (13 billion lt/year) with an internal consumption of 12.4 billion lt/year. In the USA almost 2% of the total motor fuel consumption is bioethanol.

National Farmers' Union

February 2006

Witnesses: **Mr Peter Kendall**, President, **Mr Matt Ware**, NFU London Adviser, and **Mr David Proudley**, Non-Food Uses Adviser, National Farmers' Union, gave evidence.

Q1 Chairman: Good afternoon ladies and gentlemen. In three minutes' time the division bell is highly likely to go, so what I am going to do is to formally welcome our first set of witnesses from the National Farmers' Union and then adjourn the meeting. We have before us a member of the National Farmers' Union delegation who must be the fastest rising star in terms of witnesses, because when Peter Kendall was first billed he was on my list as the NFU's "Non-food Spokesman", but since that time he has successfully won an election to be the new President of the National Farmers' Union. Can I on behalf of the Committee pass on our congratulations to you. We have always had the most harmonious of relationships with the NFU, and particularly their President. We were reflecting

before you came in how many presidents we have dealt with over the years. We are delighted that your first public outing is before the Committee, and I personally congratulate you. It is always good to see the exercise of democracy. We got on extremely well with Tim Bennett. I did pen a note to him yesterday thanking him very much for his co-operation and kindness in appearing as many times as he did during his presidency before the Committee, and, Peter, we hope that we will have the opportunity of welcoming you on many occasions and we wish you well in terms of your office. You are supported by Matt Ware, who is put down as the "NFU London Adviser". Mr Ware, what does that mean you do?

Mr Ware: Since the NFU relocated to Warwickshire we have had policy issues in London basically.

Chairman: So you are marooned here while all the work is done in Warwickshire. Finally, Mr David Proudley, who is the Non-food Uses Adviser. Gentlemen, you are all very welcome indeed. The hour of four is upon us and, so that we do not start and stop, we are going to adjourn the Committee. I will ask colleagues to try and get back within 10 minutes of the start of the division bell. Can I apologise for keeping you waiting, we had a little bit of extra Committee business to sort out, but we look forward to talking to you in detail when we come back from the division.

The Committee adjourned from 4.00 pm to 4.10 pm for a division in the House

Q2 Chairman: We can now formally start to take your evidence. Can I thank you for your written submission, which was very helpful and there will be some questions arising out of that, but I would like to start with a very straightforward question. What do you think is good about the Government's bioenergy policy and what do you think is bad about it?

Mr Kendall: Thank you very much for inviting us to come and give evidence today. As you say, it is the first day after my election and it is intriguing to be involved in the world of politics where you can be sent home very rapidly. Obviously I have sympathy. You referred to Tim Bennett. He has obviously worked with you in the past. It has been a difficult time for us all and I thank you for inviting us down as my first outing. On the Government's policy at the moment on bioenergy, I think we have some good aspects that will take priority which are being talked about. Around the whole of Europe now, the whole issue of renewables is very much in the headlines. We will be looking at Sweden making announcements trying to be oil-free by 2015. When you look at the gas crisis that has been going on in Europe in recent months, even George Bush is talking about trying to reduce dependence on imported oil. The fact that the Government has now raised renewables up the agenda is good news. I think our weakness on government policy at the moment is the lack of firm commitment to meet the goals in a certain time span. We welcome the Ben Gill Biomass Report, we welcome the RTFO announcement but there are still elements of detail that need to be sorted out to make sure that these actually come to fruition.

Q3 Chairman: Would you like to spell out the crucial points of data that you would like to see answers to?

Mr Kendall: On the RTFO agreement, Matt, do you want to cover the areas that we are waiting for detail on?

Mr Ware: Basically, as far as the Renewable Transport Fuel Obligation goes this budget is crucial. We are looking for some clear signals from the Treasury as to buy-out price, the continuation of the 20 pence per litre duty derogation and a long-term commitment, because without that level of certainty investors will not get involved and the current three-year rolling 20 pence duty rebate alone is not enough. We are looking at large scale investments. We need to know what is going to happen beyond 2010, so we are looking for some indication going to 2015, of the 5% target increasing maybe to 10% and an idea of buy-out price and how long the duty will be in place for?

Q4 Chairman: One of the things that is intriguing in the evidence is the range of greenhouse gas reductions which are said to be obtainable from different bio-crops. Bioethanol from sugar seems to suggest that, compared with fossil fuel emissions, you can go from minus 11% to a gain of 75%, bioethanol from grain minus 21% to 75% and biodiesel from rapeseed oil seven percent to 80%. Those seem to me extremely wide ranges of figures in terms of greenhouse gas emission savings. If you were looking to say, "Am I confident with a range that big", if it was money that you were putting into a financial venture that said that the rate of return could be minus eleven to plus 75, I think you would be wondering whether that was a safe place for your money. Why the range?

Mr Kendall: There are different technologies being applied and different techniques in producing the inputs to the feed stock. What is interesting is that, as we have seen other countries developing their ethanol largely from sugar or from maize or whether it is a biodiesel production, as the longer they have been developing the process the better the CO_2 savings become. It also depends very much on what you do with the by-products. For example, and I think this is one of the examples quoted, if you took a ton of maize you would expect it to break down into three parts. A third of it would be ethanol, a third of it would be distilled dry grains, which is a high quality animal protein feed, and a third of it would be CO_2. If you took the by-product, the distilled dry grains, the animal feed, and use that as the feed stock you would magnify a lot, over 100% in some cases, the CO_2 savings, if you utilised the whole amount. The other way is that we are looking at how we produce the raw material, the feed stock in the UK, whether it is wheat or sugar, depending on the yield, depending on the amount of fertiliser and how the cultivations are going, it varies on the savings, and it is why we feel, as an organisation working with other people, we do need to demonstrate with a product—with the ethanol, with the diesel—that we are giving genuine CO_2 savings. We do not want to have the accusations made, when we are supporting

a new form of fuel or a new fuel for the UK, that it is not delivering the CO_2 benefits that we feel actually give it value.

Q5 Chairman: You are saying it is the method of production. I presume that that is the way that it is, and there is nothing you can do to say that over time techniques would be able to move from minus numbers to everything being positive and that we could come towards the upper end of this range guaranteed from these different sources of raw material?
Mr Kendall: I think there is best practice involved. If I could give you one example at my farm, and I am actually a farmer in Bedfordshire. We have tried a technique where, as we harvest a field of wheat, we drip oilseed rape out behind the cutter bar, so it actually needs no cultivation at all. As you then chop the straw and grass it over the top, you have had no cultivation—you have not used ploughing and cultivation techniques—so that means that you are not disturbing the soil and that is a much more beneficial way of reducing CO_2 emissions. The Central Science Laboratory in York has done quite a lot of work on this and their figures suggest that we get at least 60% savings. We are just acknowledging that there is other work out there that will demonstrate wider swings. We would not want to come and say to you that the definitive saving is 60% when we know there is other work out there that demonstrates a wider range, but we certainly expect to see a CO_2 saving on most UK production.

Q6 David Taylor: The NFU submission, particularly at paragraph five, makes a pretty good pitch for the suitability of UK agriculture for energy crops. You talk about the experience in having annual crops like wheat, sugar and oilseed rape, and so on, and no need for specialist machinery, skills and knowledge. If that is so why are we lagging as far behind Germany and France whose aggregate economies are probably two and a half times the size of our own? In 2003 they were producing about a million tonnes of biofuels, or a bit over—that is the latest figure we have got, which is two and a bit years old—whilst the UK produced less than 10,000. That is a tremendous lag. I heard what Mr Ware said about the need for a long-term commitment on the 20 pence derogation, and he implied that the derogation should be higher, but surely it must be even more than that?
Mr Kendall: I think it is lack of certainty and also it is volatility in the oil prices. One of the things that has made people much more interested in the whole of the renewables debate and the cost of energy at the moment is what has happened to oil prices over the past year, 18 months. People are looking at it now, but even then, if you are going to go and invest maybe in a bioethanol plant where you may have £60–80 million in cost, you need to have some sort of certainty. The Germans have had a long-term commitment to a zero-rated duty on their biodiesel industry for a long time. The French have a different more imaginative scheme where they give you tax breaks if you reach certain targets of inclusion. There are various organisations, along with other people, who have been working with environmental groups and who have put so much store in the Renewable Transport Fuel Obligation, because if we do get set targets, we know we are going to be setting a 5% inclusion by 2010, that is a sufficiently large target and that will give people the confidence to go out and invest in the production capacity.

Q7 David Taylor: There is no EU fiscal cap on the amount a national chancellor can derogate, is there?
Mr Kendall: No, there is not. As I just said, the Germans are down to zero duty on biodiesel.

Q8 David Taylor: You will be submitting very strongly to the Chancellor that we should emulate Germany in that respect, will you?
Mr Kendall: No, we have actually moved away from it. We know there are pressures on the Government finances and what have you, and we think that it is more prudent to go and say that we should have an inclusion through the Renewable Transport Fuel Obligation and then you have a buy-out, and so if they all happen to chose not to be blending or using 5% of its total use of biofuels, you can pay a bio-price very similar to the ROC[1] scheme that operates in the energy market.
David Taylor: You have moved on to RTFO, and that is someone else's area of questioning.

Q9 Chairman: One of the things that struck me about this evidence was really the evidence of enthusiasts. You say in here, "There is plenty of land. We can do all of these things", and you rush, like people who have just discovered biofuels, to say, "We have really got to have all this. It is absolutely fantastic", but underneath it there is a lot of very important detail about farming economics. I was struck that there was not any economic analysis, for example, comparisons of return per hectare, which is the bottom line comparison point for different cropping patterns. It is quite difficult to understand, because we started with Mr Ware talking about the 20 pence duty derogation, but he did not mention the fact that for biodiesel that might simply be a crushed oilseed rape but not going through a process that currently attracts full duty. You did not mention the question of the Chancellor's pre-Budget announcement of capital allowances for production. We did not get any information here, for example, about the economics to the farmer of growing on set-aside land verses transferring his current food production arable cropping regime to an energy cropping regime. I do not know from your evidence whether it is good for farmers. All I know is the NFU tells me that it can be done and that there is enough land to do it, but do farmers actually want to do it? Can you help us, if not in a detailed exposé now, with some additional evidence to help us truly get behind the economics of these liquid biofuels and, for the same question, biomass as well?
Mr Kendall: Yes, we will make sure we get you some detailed figures on that.[2]

[1] Renewable Obligation Certificates
[2] Ev 14

Q10 Chairman: If there is anything you want to say by commentary, I would personally be very interested to hear it because I have not heard it from the farmer's end of the telescope. You have got a farm, Mr Kendall. Are you growing any energy crops?

Mr Kendall: Bizarrely, I actually grow energy crops, but they are swapped for bits of paper and my product ends up in a Spanish ethanol plant or a German biodiesel plant. The whole of the UK is excited enormously by the whole notion of being involved in energy production. I am an all-arable farmer. Whether I grow wheat, oilseed rape, beans or maize, those commodities are cited on the MATIF[3], or, particularly with oilseed rape, there is no oilseed rape futures market in the UK, or in the London Exchanges, so I know exactly what my commodities are worth, they are traded. Whether they go for food or whether they go for fuel, they are completely interchangeable. The economics mean I make a decision whether I plant my wheat whatever the market availability is. The reason why we are so excited about this opportunity is not just the economics of it, because the more we can displace the less I have to sell into foreign markets. The more we consume here, the more we get the benefit of the shipping costs. If we have an exportable surplus from the UK, at the moment this year we will export about 2.5 million tonnes of wheat—we have some years exported as much as 4.2 million tonnes of wheat—that has to then be competitive into our export market, whether it is North Africa, whether it is Southern Europe, particularly in the dry years it often goes to Southern Europe. If that commodity stays within these boundaries, that would be at a price we call an import parity rather than an export parity. That difference could be as much as 12 or £15.00 a tonne according to the Home Grown Cereals Authority figures. There are big advantages if we can find markets internally, and also I think it will drive a new market in the UK where people engage in longer term professional contracts. The biomass question you asked about as well, the economics for that, it is more uncertain, but where I am very concerned about agriculture and farmers is where people have taken a leap of faith and they have planted long-term coppice schemes and have found there is no market. The biggest submission I tried to put across from Ben Gill's Biomass Report was the need for demand pull rather than getting over concerned about supply chain inadequacies. Ben's comments were that we needed almost a Yellow Pages where you could go and buy your biomass. What we need is to know that there will be some guaranteed markets there. I look around at the 470,000, 480,000 new homes looking to be built in the south-east, if that was in Denmark or Sweden they would have a compulsory district heating scheme, a combined head and power scheme, which seems to me a brilliant use of renewable by-product from farming if we could do that. The value at the moment is not high enough to drive people to do it economically and give them the certainty that the market will be there. The figures do stack up and, as I say, we will make sure that you have them in detailed form as soon as we can.

Q11 Mr Drew: Can we look at the other side of the coin. You are talking about exporting to elsewhere in Europe. Let us keep the barriers to bioethanol production in this country. In your submission you say you believe you can meet the RTFO target for 2010, and the estimate is somewhere between 1.15 and 1.35 billion litres. What is going to make that happen and what is going to stop it from happening?

Mr Kendall: I will come to Matt in a minute. I think there are some real concerns about what level we start on the RTFO announcement, whether we start at a low level in 2008 or whether we start at a high level. If we started at 2% we could probably meet a big percentage of the demand for 2% inclusion from a matter of internal production of biodiesel and imported palm oil biodiesel production, and that would prevent bioethanol taking off. If we are starting at, say, 2, 3% in 2008, 4% in 2009, 5% in 2010, the oil companies will know that they cannot meet that just in biodiesel alone, they will need to be bringing in bioethanol as well. We think by setting a high enough inclusion rate in 2008 we will find investor confidence kicking in. We had an announcement at our AGM yesterday from David Reid of Tesco saying they have signed a deal with Cargill's Green Energy Fuels to start investing in biodiesel production.

Q12 Chairman: From UK-sourced feed stocks?

Mr Kendall: That is their intention, and they have also done a deal with British Sugar for bioethanol—their Wissington plant in East Anglia—so there are encouraging signs but we need to have bold enough targets to drive it forward. Again, as Matt said earlier on, we need to make sure that the buy-out costs are right so that people do not decide just to say, "I will pay the forfeit", rather than making the inclusion.

Q13 Mr Drew: What additional incentives do you need through the industry? We have already touched on this, but I want to know in more detail what signals the farmers actually want. Some have taken a leap of faith, but they have taken a leap of faith in the past and some have got their fingers quite badly burned. What are the numbers and who will provide the gap finance? Presumably it will be the Government. What more do you want the Government to do? I have been at presentations where they virtually solve the whole of the world's problems through bioenergy, but then they mention afterwards maybe there will be a bit of something for the UK. There seems to be a view that the Third World will automatically go to bioenergy and that will solve all our domestic problems. That is the threat at the least?

Mr Ware: We are very excited about bioethanol in particular because the UK has got this huge exporting surplus; so the feed stocks are there and we can provide 5% by the 2010 target, no problem at all. The problem with bioethanol is that it is a more

[3] *Note by witness:* Marché à Terme International de France (MATIF) is a French commodity exchange.

involved production process than biodiesel and therefore there is a higher infrastructure cost involved, which is why we need the certainty of the RTFO put in place, a long-term RTFO, and the buy-out price and figures set to give investors confidence.

Q14 Chairman: Could you explain? When you talk about the "buy-out price", what does that mean?
Mr Ware: Under the Renewable Transport Fuel Obligation oil companies have a choice either to provide biofuels or to pay a penalty or a buy-out, and that is an obligation not a mandate. If this price is set too low there is a real risk that oil companies will pay out the penalty and not invest.

Q15 Chairman: Who is going to set the price? I would have thought the market price of carbon is going to set the price.
Mr Ware: The price will be set by the Chancellor and we will be seeking a figure in the Budget this year to give some certainty to the market. If the price is not announced until next year, it delays the build of many new plants by an additional year and reduces the opportunity of achieving our target by 2010. Investor confidence is needed to put in these plants because they are so expensive. Obviously for bioethanol the enhanced capital allowances that were announced in the pre-Budget statement were extremely welcome and helpful, but what we would like to see is more of a lead from local government and regional government in things like public procurement. We have got a very good demonstration project in Somerset, where they are using E85 (which is 85% bioethanol) powered cars by the local police constabulary, the county council and the water authority and various other organisations, and that shows a real lead. The problem is that we need that sort of government lead giving the infrastructure at the fuel pumps. Another barrier to bioethanol production in the UK at the moment is engaging the oil companies, the oil majors. At the moment they are coming up with various reasons why it is going to be difficult, which we find quite confusing because they seem to be able to do it elsewhere in the world, the same oil companies—Shell, Exxon, BP, and so on. The sort of arguments they come up with are things like they cannot share oil pipe lines with aviation fuel and bioethanol and there are problems with tanks at fuel filling stations, and so on, and they are basically asking for more time. Interestingly Tesco last year introduced 5% bioethanol in 185 stores in the south-east and the north-west, and when we met with them last year they said there was absolutely no problem. They just serviced the tanks—it takes a couple of hours—and they can put a 5% blend in. We feel that maybe the oil companies need to engage slightly more enthusiastically. Finally, there is a problem with European quality standard. European fuel quality standards at the moment say that a 5% blend is all that is allowed on current EN European quality fuel standards. Unfortunately the committee that changes those fuel quality standards is dominated by the oil companies and there seems to be some resistance to changing those fuel pumps.

Q16 Chairman: I thought that was to do with motor vehicle manufacturers who would not warrant cars above 5% inclusion rates.
Mr Ware: Yes, it is all in the same pot. Again, these vehicles are warranted up to 10% as standard in North America, which we find quite confusing. We think there may be a vested interest involved there.
Mr Kendall: We think the E85 is a great example of something we could really get some marketing presence out of for green motoring. Stockholm, where you have no congestion charge, no parking charges as well if you arrive in an E85 car, is a good example of green motoring.

Q17 Chairman: And E85 is?
Mr Kendall: Eighty-five per cent ethanol. Saab, Volvo and Ford are working on these cars. You can put petrol into the tank if you find a pump that has only got petrol and you can put E85 in it down the road. Matt and I went to the United States to see ethanol production and there are a number of these pumps springing up everywhere. It is reported in Brazil at the moment that 80% of new cars are being sold as flexi-fuel E85 cars. The growth of ethanol consumption is rocketing.

Q18 Mr Drew: Could I make one final point. As someone who has had an LPG[4] car for some time, it is a nice notion that everybody co-operates with the customer, but you really are a hostage to fortune with the petrol companies. They have never played fair with LPG. They have always been a minority provider, let alone the interesting way in which you have to try putting it in the vehicle. It is just not there, and it is very interesting that, as a result, it has virtually stayed at the same level now for the last three or four years. This was the great answer, and it is just not happening?
Mr Kendall: We have an LPG car on the farm at home and it is a pain in the neck to find a petrol station to fill it up. It is not been made easy, and that is why, I suspect, it has not happened, but E85 has exactly the same delivery system. It is like petrol.

Q19 Lynne Jones: You were referring earlier to the need for investment and yet, Mr Kendall, you said that as far as you were concerned your crops were interchangeable—whether you sent them for food or bioethanol it did not matter—so the issue is not investment for farmers, it is for the producers of the fuel. Am I right in that?
Mr Kendall: Yes.

Q20 Lynne Jones: You are talking about 85% bioethanol powered vehicles. That might be feasible, but it is impossible for this country to produce. We are only able to produce about 5% from indigenous resources without handing over a vast hectarage of the land. What is the point of going to 85%? Surely, rather than having a small proportion of vehicles having 85% bioethanol, is it not better to make sure we achieve the 5% target throughout the country?

[4] Liquefied Petroleum Gas

Mr Kendall: The point of E85 is that with an obligation it is not mandatory that every litre sold has 5% biofuel in it. There might be certain markets that are still left with 100% conventional fuel. You could have areas like London and Somerset where there is a concentration of E85 cars where you have a lot more being delivered through E85 engines. What we have not picked up enough on here is that this is the start, this is what we call first generation bioethanol and biofuel production, and there is a lot of work going on using enzymes in Denmark and Iogen in Canada where they are looking at cellulosic ethanol production. If I can take my wheat, use my wheat in a first generation production facility producing ethanol from my wheat, I would also use the straw and extract the ethanol from the cellulose, and then you make it much more efficient and you increase your output significantly. There is work going on in relation to cellulosic ethanol production from woodchips as well, so this would increase our whole capacity to produce from other resources.

Q21 Lynne Jones: Can you have an engine that can work on 5% bioethanol or 0% and 85%? I travel between London and Birmingham, and so I want to be able to fill up at different petrol stations. Is it feasible to have a fuel that has that vast range of the proportion of contents, bioethanol as opposed to the conventional mineral oil?
Mr Ware: There are two distinct types of fuel here. There is the 5% blended bioethanol or biodiesel and conventional petrol. It is only limited to 5% because that is the European quality level. For the RTFO it would have to go up to 10%, but at the moment it is 5%, and that can go in all conventional cars, but you have to remember that there is a huge conventional car fleet out there of 32 million vehicles in the UK. It can go into all those vehicles. In addition, the new generation of flexible vehicles can use 85% ethanol or normal petrol. If you were in London and you filled up with 85% bioethanol and then you went on holiday to Scotland, you could put normal petrol in the car in Scotland and then when you come back you can put in E85.

Q22 Lynne Jones: You would have to have newish car for that?
Mr Ware: You would have to have a new car, but the great news on that front is that Saab, Ford and Volvo are all producing cars at exactly the same forecourt price, a completely flexi-fuel vehicle, and that is why we are seeing massive increases in sales in Brazil and Sweden. We have got two distinct areas. We have got blending at 5% of all cars and then these new flexi-fuel vehicles, which we would like to promote through Government procurement.

Q23 David Lepper: You talked about the role of local authorities and the things that are happening in Sweden, and so on. Are there any signs, so far as you are aware, of local authorities in this country taking that seriously?
Mr Ware: There is a pioneering project, as we have already mentioned, in Somerset which is great, and that is rolling out. They have got 55 Ford Flex vehicles actually ordered, which is great because it is not hypothetical, it is actually happening, and they have got five pumps strategically located around the county. On the back of that we have got interest from Gloucestershire, Hampshire, Oxfordshire and Kent, and so we would be very keen to spread the good example around the country, but the great thing about getting local government involved is that they do have depots where they have fuel tanks and they have large fleets of vehicles which can make it more economical rather than individual farmers or forecourts trying to do it on their own.

Q24 David Lepper: What I was actually scheduled to ask you about was the energy crop scheme, but thank you for that information. You have talked about and you have shown enthusiasm for production, you have also talked about the lack of certainty. On the figures that I have got for 2004—there may be more recent figures—the take-up in terms of the energy crop scheme (and I understand that is 45 euros per hectare of non set-aside land for energy crops) does not seem to be very high. It was 300,000 hectares in 2004. I do not know whether there are more recent figures that show an increase or whether it is about the same. Why do you think that is? Is there anything that can be done by the Government to improve?
Mr Ware: It has been a very disappointing uptake, but when you do the figures in old money it works out at £12 an acre, which basically is not a lot of money. There has also been a risk that the European ceiling of 1.5 million hectares is exceeded pro rata, so there is a level of uncertainty in there, and probably, most fundamentally, we have found that there have been administration costs put in by a lot of merchants that service the contract for the energy crop aid which has further eaten into the £12 an acre. Because of the very disappointing figures, the European Biofuels Strategy announced last week in London is going to review the Energy Aid Scheme levels, and they were hinting that there may be an opportunity to increase the value in the future. Any indication or suggestion you can make to the EU Biofuels Strategy encouraging them to do that would be very welcome.
Mr Kendall: If I could come in on that. You are all aware, obviously, of some of the problems we had in getting the single payment scheme payments out this year.

Q25 Lynne Jones: Have you got yours yet?
Mr Kendall: I have not had anything yet. When my colleagues in Wales will receive their money, it is a bit of a moot point at the moment.
Chairman: You can have a pint on them then.

Q26 Mrs Moon: We do things more efficiently in Wales.
Mr Kendall: Particularly after the rugby, I will not comment on the Welsh!

Q27 David Lepper: Do you know anyone who has got one yet?

Mr Kendall: I have seen one cheque in a photocopy form. Someone received one down in Devon.

Q28 David Lepper: It is being passed around?
Mr Kendall: It is, yes, it is being looked at with amazement. This energy scheme payment complicates your application for an ECS under the old scheme; and certainly this year I took the decision on my farm not to apply for any energy supplement payment because it complicated things—I thought it might have held it up, but I did not realise it might hold it up to the end of June—so I stayed with a simple system on my farm and lots of farmers did in the year we have just experienced. Before that there was also a lot of oilseed rape, which is a main crop. In 2004–05 a lot of the winter oilseed rape failed because of the incredibly dry autumn. That was why the year you refer to was very low. This year we have got the Single Payment Scheme sorted out. I think this year the uptake will be much higher. I have certainly registered all the oilseed rape on my farm, which is not on set-aside land, for energy crop supplement.

Q29 Chairman: Hang on a minute. You said to us earlier on that you were quite happy, whatever the use for the arable crops—they could go to energy or they could go to food—and you did that because the economics for your farm were right and you did not want to mess the system up. Now you are telling us you definitely want £12 an acre. Why should anybody give you £12 an acre for doing this? If you are telling us that the Chancellor, who might be stuck for a bob or two, ought to be sustaining the 20 pence a litre duty derogation and ought to be handing out the nation's millions in capital allowances and you need all that to give certainty and encouragement, why are you then going to pinch money to go into this pot?
Mr Kendall: First, half of it disappears to the merchant who has to put up a complicated bond to the EU to make sure it can get the money back. Second, I am then tied to the merchant I can sell it to and when I can sell it, so putting my oilseed rape in an energy crop scheme reduces my business flexibility a lot. Bearing in mind, on an oilseed rape crop, I might in a good year average 1.4 tonnes to the acre, with a little bit of fluctuation on when I can sell it or I can move it. If I am not careful, I get the sums wrong and am not able to market it for the best opportunities. This year I have taken a view that I want my money in that certain period. The rape price I thought was reasonable, and so I have locked into it, but there are reasons why you would not as a businessman, as a farmer, automatically lock into that price at that time. The incentive, once you have lost half of £12 in bureaucracy and handling, is not that much of an inducement.

Q30 Chairman: So why do we need it?
Mr Kendall: The idea is to encourage and stimulate energy production. The sad situation in the UK is that it is just a paper exercise. All we are doing is buying the rape. It actually depresses my market: because I grow rape in the UK that is meant to be for energy production, it stays internally and overhangs the market, whereas in Germany, where by counter transaction the opposite bit of paper turns up, they draw that rape off the market. The rape price in Germany, because of the demand for energy and fuel, is usually about £10 or £12 a tonne and getting higher than mine would be here. There are some real anomalies that go on because we have not got domestic production. I am very keen for the whole RTFO initiative, but we really need someone to sit behind the investors who are prepared to build the plants and have the demand in turn.

Q31 David Lepper: You mentioned the discussions last week, I think you said?
Mr Kendall: Yes.

Q32 David Lepper: Was that solely about the figure or was it about the mechanics of the operation of the scheme you are talking about?
Mr Ware: The European Biofuels Directive in 2003 set the target for last year and the 5.75% target for 2010 and it always decided to have a review in 2006 to see how they were getting on, and, as part of that review, they announced seven areas of discussion under the EU Biofuel Strategy last week. The energy crop aid is just one of those seven areas.

Q33 Lynne Jones: I am intrigued on this point. Would it not be better to make sure that if there is support needed for the investment in the plant that needs to produce the bioethanol or the biodiesel, where perhaps the support needs to go, why do you need to declare in advance that such and such a proportion of your crop is going to go for biodiesel? Would it not be better to make sure that you create the demand and then you could decide where you actually market your crop?
Mr Kendall: I think I tried to make the point earlier on, I have always been much keener on demand pull than trying to stimulate supply. This is a European scheme. The Europeans are much keener on saying that farming needs extra support to grow these crops and therefore put it in place. That is why as an organisation we have moved to supporting the Renewable Transport Obligation as a key point. Twelve pounds is not a big sum of money. The amount of money that ends up with me is quite small. The most important thing for me as a farmer is to see the internal demand and internal capacity built within the UK, and that is what I am keen to start with.

Q34 Mr Vara: I would like to turn your attention to the carbon assurance schemes and the importance of a carbon certification scheme to ensure that energy crops are grown sustainably, safeguarding biodiversity and the wider environment. In order for such an assurance scheme to be successful, the NFU believes that it must include a "banding system to reward the most efficiently produced biofuels".[5] How do you envisage that this might work and how do you think it might be regulated?

[5] Ev 3, para 19

Mr Ware: Under the Renewable Transport Fuel Obligation there is an opportunity for recycling of funds and those funds are the buy-out price, or the penalty price that we talked about earlier, and it will go into a central pot or pool. Under the Energy Bill amendments it states that that money should be recycled back into the industry, but it does not go into any detail. There is an opportunity there for those monies to be put into supporting or encouraging the most efficient forms of bioenergy production in the UK, so there could be grant availability for cleanest fuel production standards, and so on, but it is an area that under the Renewable Fuel Transport Obligation has not been investigated or discussed in any great detail and we think it is a great opportunity to encourage the greenest fuel production possible.

Q35 Mr Vara: Of course there is the difficulty that farmers are always complaining that there is a lot of bureaucracy in the entire system. To what extent is this going to create more bureaucracy and what sort of response and support have you had from the farming community generally?
Mr Kendall: Speaking as a farmer, we have Farm Assurance now on farms where we are inspected on a yearly basis, which looks at how I produce my crops, makes sure I look after my water courses, how I treat my fertiliser storage and my crop management records. We think that is one visit already we would not want to duplicate. That would demonstrate that I am growing in an environmentally responsible way. Where we then would want to move is attaching it to, for example, something where I record my total amount of fertiliser used in relation to the anticipated yield. We would then like to relate to something along the generic line, and this is something that is being talked about at the moment in the industry as a whole, that rather than have a detailed analysis for my individual farm, if, for example, you are growing wheat in the United Kingdom, three and a half tonnes of wheat would give you, say, 65, 70% CO_2 savings, and have a generic system that did not add to detail in depth around the quality of individual farms. We would have the farm assurance with some sort of record of the amount of fertiliser used as a key input and then we would use a generic acceptance of it.

Q36 Mr Vara: Turning to the international scheme, the NFU has argued that a scheme "must be applicable throughout Europe and compare with world imports".[6] English Nature, on the other hand, although supporting the scheme, has raised concerns that it might conflict with the World Trade Organisation rules. How does the NFU feel the international scheme can be dealt with, bearing in mind you have got this conflict? Do you want to expand on the one hand and tell us if you have any reservations as well?
Mr Ware: The Department for Transport and the Government at the moment have been looking into this in great depth, and their legal advisers say that on carbon saving grounds there is not a problem in looking at environmental accreditation. However, there is more of a problem under the WTO when we start to invest in sustainability production. That is why we are very interested in the work done by Imperial College and others looking at carbon saving or a biocycle analysis of the whole crop. In the UK, through assurance and the work of the Central Science Laboratory, we know what our carbon savings are—at least 60% in our conventional crops—and the challenge we would like to put out to importers is, "Tell us what your carbon saving is." What we are very concerned about is that there would be over complication and over accreditation of UK produced crops, just simply because it is easy to do, and almost a disregard or lack of interest in the imported products because it is too complicated. For example, one scenario I would like to give, bioethanol coming from Brazil on a ship, there is a relatively low carbon amount used in the freight, a tanker it is quite efficient. There is a huge difference between the bioethanol from Brazil whether it is produced on the coast or whether it is produced a thousand kilometres inland, because it has to get to the coast first.

Q37 Mr Vara: Is this message getting through? Are you actively making sure that people are discussing this and getting involved, getting the message across. Are they being responsive to your thoughts?
Mr Ware: We are battling away. As I am sure you will appreciate, there are an awful lot of environmental groups out there, and there is only one NFU. We feel that we are sometimes a lone voice on this. We would hate to see our proven carbon saving crop production perhaps being exported to third countries where we do not know about their assurance and accreditation. One criticism of biofuel production that used to be given was that we would create monocultures of oilseed rape, or whatever, across the UK. The fact that all the feed stocks used in the UK—oilseed rape, wheat and sugar beet—are rotational and therefore move around the farm and therefore are not monocultures, could be lost to third countries where we have monocultures of sugar cane, palm oil or *jatropha curas*, and I think that is a very important point to remember.

Q38 Mrs Moon: I would like to talk, if I can, about the conflict between achieving food security and energy security, because we are getting quite conflicting statements made. We have, for example, a statement from yourselves saying that food crops will not be adversely affected. You have said already that the crops are dual-purpose, so you can go where the market demand is, and at the moment, Mr Kendall, you have said that a lot of the crop that you produce is exported and, in fact, the market, if it was here, could at least remain in this country which would also perhaps increase profit to you because you would not be paying for the transport costs for export. Equally, we have got the Food and Drink Federation expressing concern that the financial incentives to go into biofuel production would

[6] Ev 3, para 19

impact on costs for them of producing enough. The Margarine and Spreads Association have also expressed concern. There is concern that there is insufficient set-aside land to meet the increased capacity that would be needed to provide the energy crops for biofuels. Equally, we have got the RSPB expressing concern that the pressure to provide additional land would result in set-aside land—that is land of nature conservation value—being pulled into production. How do we meet all these conflicting demands and create a balance so that, if there are increased subsidies going into energy crop production, we do not end up in a situation where we do not have enough food stock production?

Mr Ware: First of all, the Food and Drink Federation report comes from their European umbrella body IMACE, which is the European margarine organisation, and primarily their concerns arise from central Europe, primarily Germany, where there is an awful lot of oilseed rape being used for biodiesel because of the very preferential or no duty rate. It is a different scenario in the UK. We have not got such an imbalance. We see a mixture of bio-ethanol and biodiesel and we have not got the same pressures. They have actually been to visit us in the NFU and said that the prices are rising, what do we think, and we actually said, "That is great." We want our oilseed rape prices to increase. The point we would like to make is that oilseed rape prices are actually recovering. They were a lot higher back in the 1980s and early 1990s, they had fallen and now they are recovering. The Food and Drink Federation has been saying that their costs of production are going up, which is true, but they are only recovering from what they were, they are not historic highs. As far as the RSPB and set-aside land goes, it is a slight misnomer because set-aside was never intended to be for the environmental good, it was meant to be a way of reducing our food mountains, and we should always remember that. Now we have got the opportunity to change from food to fuel production, and we are quite concerned about the whole set-aside scenario because under the Single Farm Payment and CAP Reform it is likely that set-aside will be removed by 2013 anyway, so we think it is far better to base our bird and environmental policies on whole farm approaches rather than just set-aside and put all our weight behind the new entry level schemes and higher tier schemes to get bird and environmental life enhanced across the whole farm rather than just 9% of the farm, which you develop a great bird habitat on and then in 2013 somebody comes along and ploughs it up.

Mr Kendall: I am also unable to grow energy crops on my set-aside already. For example, I would have to have on my farm a couple of hundred acres of set-aside, and I would grow that in winter oilseed rape and it goes for energy crops on the back of that, and it is allowed to happen. It is already happening on a percentage of the set-aside, but we feel very strongly that set-aside was a market management tool and should not be confused with an environmental tool.

Q39 Mrs Moon: To be fair to the RSPB, they did talk about areas specific to nature conservation, such as peat bogs, and they were talking about wetland sites. Their concern was that you would go back into, for example, drainage of land so that you would create new land for development, and Defra, in fact, does say most energy crops are grown on set-aside land in fact. I think again, Mr Kendall, you have talked about dual-functionality and the fact that the way that a single crop is manufactured and produced can actually save energy costs and biomass. Can you go into that a little bit more?

Mr Kendall: Yes, I will talk about dual-functionality in the crops I currently grow. We see a strong bioethanol industry growing within the United Kingdom. I think we see that very much as leading to more research and development into modern varieties which will be higher in starch content, might mean lower levels of fertiliser going on, might need different pesticide regimes. We are optimistic that with a strong demand structure for bioethanol we will see new varieties coming through that are specifically developed for that. That would reduce their dual-functionality, but I am sure they would still meet an animal feed demand if required. The one thing I find comforting about the whole generation of renewables, and I am nervous for the people behind me who want to build these plants, but if we had a situation where we had a number of years of very low production because of some of the vagaries of climate change, I would rather have the infrastructure in place and crops being grown. If we had to draw on more fossil fuels for a period of time, we would still have the crops being grown and they would still be there. To me it is a better strategic reserve than the food mountains in Brussels and intervention in other reserves. Every year we do it we are reducing CO_2 emissions, and let us encourage that.

Q40 Mrs Moon: Are you talking about genetically modified crops?

Mr Kendall: No, I am talking about plant renewables.

Q41 Mrs Moon: Would you comment on plans that we see for the Government to close some of their research establishments. Would you have a concern that that seems to be on the cards?

Mr Kendall: I would have a great concern. One of the enthusiasms I have for the whole development of non food crops, and we have done a big climate change report from the NFU, I think when you look at the vagaries of what is going on around the world at the moment, we should be investing more in research and development. One of the reasons I got involved in my new job is that farming can be the provider of smart solutions, and when you look at what is happening with biogas production and the suggestion that there will be 10,000 biogas plants up and running in Germany by the end 2009, there are really exciting things which farming can do with its by-products, with the use of land, and we should be investing in this and it is something I feel very strongly about.

Q42 Patrick Hall: Picking up on that enthusiasm, what has the NFU done and what is it planning to do to try and spread that enthusiasm within the automotive industry and, indeed, the energy industry, the oil industry, much of which says it is into energy?

Mr Kendall: I could facetiously say, I am the new President of the NFU, and it would be rather rude to say that, I know. A big part of the message that has been sent to me in my role is that they want a more proactive message of what farming can do in solution providing. I have made many speeches where I have talked about the fact that for 20 years farmers have been seen as real problem because of our environmental track record—over supply, the diseases we have had, which are all scars on our backs from Foot and Mouth Disease and BSE. I believe we have got real opportunities, and we want to work with other organisations that see farming as being beneficial. A lot of the environmental groups also see us as delivering a lower carbon economy. One of the reasons I am so keen on the accreditation scheme is if we get this wrong, if we demonstrate that you are doing damage to try and develop renewable solutions, it will set us back a long way, and we are very keen to make sure that is this done in a responsible way.

Chairman: Thank you very much indeed, it has been a very useful opening to this inquiry. I think you have given us not only a lot of very valuable information but perhaps have raised issues and questions which we had not thought of which we will want to investigate further. Thank you in advance for the further information on the economics of biofuel production that you are going to send us. If there is anything else that you feel would assist our inquiry in the light of the questions we have asked, please do not inhibit yourselves to sending that as well. I hope you enjoyed your first presidential outing giving evidence to us, and we look forward to seeing you again in the future.

Supplementary memorandum submitted by National Farmers' Union (Bio 14a)

ECONOMICS OF PRODUCING FOR THE BIOENERGY MARKET IN THE UK POST—CAP REFORM

1. With the introduction of decoupling, farmers are able to make cropping decisions purely on economic analysis and market signals, rather than the need to grow a certain area of crop to claim a payment. This allows greater freedom for farmers to seek alternative markets that might better suit their farm circumstances. The NFU's written evidence to the EFRA Committee showed that UK farming has the capacity to provide feedstock for the domestic bioenergy market. The question of the current economics behind the market was raised and whether farmers would be attracted to produce for this market.

2. Gross Margins (crop output minus variable costs) are traditionally used to provide comparisons of crop returns within a farming system. This can be a blunt instrument when comparing national averages, as conservative values are usually taken and are not necessarily accurate for specific farm circumstances. This is particularly true for specialist crops where less data is available. The table below contains realistic and achievable estimates for crop output and costs that serve as a guide to general crop economics at current prices.

Indicative crop economics

	Estimated yield (t/ha)	*Estimated price (£/t)*	*Estimated gross income (£/ha/year)*	*Estimated variable costs (£/ha/year)*	*Estimated gross margin (£/ha)*
Wheat	9	70	630	240	390
Oilseed rape (OSR)	3.25	150	487	220	267
Miscanthus[1]	13 odt (oven dried tonnes)	45	585	234	351
Short Rotation Coppice (SRC)[2]	10 odt	45	450	230	220
Set-aside[3]	—	—	—	30	

3. These figures are best estimates based on real examples to give an illustration of the current economics involved. Actual on-farm calculations will vary according to location, access to contracts and the ability to reduce variable costs through extending the use of own machinery and labour or involvement in machinery sharing schemes.

[1] Estimated figures once crop established.
[2] Estimated figures once crop established, yield averaged per year over three-year harvest period.
[3] Estimated costs for establishing and destroying green cover on set-aside.

4. At first glance the gross margin figures do not make good reading and when average fixed costs for an arable farm (£615/ha) are taken into consideration it paints a very bleak picture and illustrates why the Single Farm Payment (SFP) is so important. The biofuels market and biomass for energy markets currently make use of very different crops and should be considered separately.

Energy crops for biofuels

5. Farmers currently growing wheat and oil seed rape (OSR) for the food market will be able to grow these same crops for the biofuel market. Although prices are likely to be slightly lower (compensated by the ability to grow on set-aside land or claim the energy aid payment) the economics will be very similar. In order to sustain a profit at today's prices farmers need to either reduce costs, increase price or increase yields. Producing energy crops for biofuels offers farmers the chance to potentially do all three.

6. *Reduced costs.* With low gross margins for cereals, arable farmers are very keen to maximise the area grown in an attempt to reduce fixed costs per hectare. The potential to grow energy crops on set-aside using existing machinery to provide income rather than a management cost only will be an attractive option to those farmers that can make a net profit growing wheat and OSR. Even with the current low margins shown above, for the most efficient farmers the chance of growing wheat or OSR on set-aside land for biofuels will be attractive.

7. The option of growing biofuel crops on non set-aside land will also be an attractive option if prices offered in contracts are comparable to the food-use alternative. The €45/ha payment and potential to reduce crop inputs will attract some growers. At present in the UK much of the energy aid available to farmers is lost in merchant's administration charges which, where levied, significantly reduces the incentive to growers. This should be less of an issue if the domestic biofuels industry is developed and the actual crops are processed in this country for biofuels. The EU is set to review the energy aid payment at the end of 2006.

8. *Increased prices.* The UK is currently a net exporter of wheat (2.5–3 Mt pa). Decreasing this surplus through a domestic wheat for bioethanol market will bring the domestic market closer to parity. As the market moves from export to import parity the domestic wheat prices, particularly in regions able to access these new markets will rise by approximately £10–15 per tonne (the difference in the costs of exporting rather than importing grain). As wheat prices rise, the profitability of wheat and the supply will increase accordingly.

9. *Increased yields.* The dual purpose and annual nature of these crops is an important factor as this gives flexibility in planning and should provide a link between prices for crops grown for food and energy uses. At present the economics of producing crops for food or for biofuels are very similar, the varieties, agronomy and yields will vary little. In the future as more research and development is invested specific varieties could be introduced offering the potential of lower inputs and greater starch or oil yields, improving the economics of production.

10. The option of growing energy crops for biofuels will therefore be attractive to many UK farmers. They are already used to growing such crops for food and have the technical skills and knowledge to grow them for fuel.

11. The importance of developing a domestic biofuels industry can not be understated. Whilst the economics at present are marginal and support is needed to help develop the industry, as oil prices rise and the industry becomes more efficient at producing fuel from biomass the economics will improve. If the UK fails to take this opportunity we will become reliant on imports of both biofuels and fossil fuels, thereby losing control over fuel supply, carbon savings and environmental sustainability.

Biomass crops

12. It is harder to estimate the adoption of biomass energy crops using standard economic analysis. *The biomass market must be demand led and availability to suitable markets will be the key for any farmer*. The significant investment of establishing biomass crops needs to be reinforced with long-term demand for the crop at a suitable price. Growing short rotation coppice (SRC) and Miscanthus is a long term commitment for a farmer; the crop must be in the ground for a number of years before any economic return is shown.

13. The figures given in the table show biomass prices that are available on some contracts today. A long term contract at these prices will be attractive to some farmers. The decision to grow biomass for these markets will depend on individual farm circumstances. It may offer the chance to reduce fixed costs, or a more profitable margin than other crops on less productive land or set-aside.

14. The economics of biomass production vary depending on end market location, type of energy generation and any processing required. Location is very important; transport costs for biomass can be expensive and excessive distance will seriously erode profit margins. Processing costs can also be prohibitive in some biomass projects. Where the raw material needs to be processed before use, such as by pelleting, the overall costs are greatly increased. Machinery and contractor costs are another major consideration and can be reduced by machinery rings and dedicated producer groups to provide feedstock for particular projects.

15. The economic figures in the table show estimated returns for SRC and Miscanthus once the crop is established. Both crops have high establishment costs and have low yields in the first few years which needs to be taken into consideration. Establishment costs are in the region of £1,200–£1,700/ha and the current grants available are essential to help cover some of these costs (£1,000, £920 respectively). In recent years establishment costs have decreased as equipment and planting techniques have improved whilst costs of the planting stock has also reduced. Although establishment costs should continue to decrease it is very important that these grants remain in place for the foreseeable future.

16. Where there is sufficient long term demand for a dedicated supply of biomass, farmers will grow to supply that demand with the most appropriate energy crop as long as the transport, processing and storage costs are not prohibitive. Farmers are unlikely to grow without first identifying a market and ensuring a long term contract is in place. The most successful biomass projects in the country have shown that the economics can be right when sufficient attention is devoted to planning. These successful projects need to be replicated. The most attractive projects will be those that are local and require a constant and reliable supply that can be guaranteed only through secure supply arrangements for local dedicated energy crops, which follow investor confidence. Regional development agencies could play a useful role in bringing together suitable supply and demand requirements in the local context.

17. It is worth stressing again that this industry is in its infancy and that whilst it requires support at this development stage to compete with the established energy markets, the potential to improve efficiency of production, energy and carbon savings is considerable. Synergy between biomass crops and other renewables such as biofuels has yet to be fully explored in this country. These two markets should not be viewed as competing uses but as complementary parts of the renewable energy package.

18. The bioenergy industry needs support today to help development so that as new technology emerges in the future and fossil fuel prices rise the UK can take advantage of an efficient, reliable and environmentally sustainable energy industry. Given sufficient demand for energy crops either biomass or biofuels, farmers will be able and willing to provide for the energy market as well as the food market.

National Farmers' Union

March 2006

Memorandum submitted by the Renewable Energy Association (REA) (Bio 27)

EXECUTIVE SUMMARY

1. The Renewable Energy Association (REA) welcomes the opportunity to submit this evidence. The REA has over 400 members, active across the entire range of renewable energy resources and technologies. It is the only UK-wide association representing the biomass sector.

2. This response is necessarily lengthy as it covers all forms of biomass and the role of these fuels in power generation, heat production and the transport sector.

3. The key observations raised in the context of the response are summarised below.

4. There is considerable potential for carbon abatement in the UK using biomass energy systems. While estimates vary, this potential is likely to be in excess of 12 MtC.

5. Exploiting this potential has to date been hampered by a narrow focus from Government upon the power sector, and specifically upon incentivising advanced technologies that remain unproved in the UK marketplace.

6. In contrast to other renewable energy systems, the cost-effectiveness of biomass energy systems is dependent upon the costs of biomass feedstocks as well as the market price for delivered energy, requiring special consideration in the design of incentive frameworks. The cost-effectiveness of different systems and corresponding levels of support required are highly case-specific.

7. Co-firing of biomass has the potential to emerge as one of the successes of the Renewables Obligation. However regulatory constraints risk limiting the potential of co-firing to both to deliver carbon savings and to assist the development of a supply chain for energy crops.

8. A more appropriate classification of biomass co-products under the Waste Framework Directive and the Waste Incineration Directive (WID) would deliver a significant step forward in making more efficient use, as an energy source, of the by-products of agriculture and forestry.

9. Further measures to encourage sustainability in biomass supply chains may be appropriate in cases where normal commercial incentives and established regulations cannot deliver this outcome more efficiently. Where further measures are necessary these should take due account of the international nature of markets and the wider impacts that will arise.

RESPONSE TO QUESTIONS RAISED

(1) *What is the real scope for biomass and biofuels to contribute to tackling climate change? What proportion of the UK's energy and transport fuel needs could they provide?*

10. The scope for biomass and biofuels to contribute to tackling climate change is considerable, since this source of renewable energy can contribute across all sectors of the energy market and can be utilised at a range of scales from the domestic level to large scale industrial applications. It can be employed in a wide variety of processes at various stages of commercial and technological maturity, from co-combustion with fossil fuels in conventional cycles to higher efficiency, state-of-the-art processes. Biofuels can be blended today with petrol and diesel for automotive use, while biomass offers an easy replacement for an oil or solid fuel boiler in homes, schools and factories.

11. The scale of the resource available to the UK is considerable, including as it does forestry and agricultural crops grown for energy, and food crops. Note that in general food crops are no more than 50% efficient, in that for every tonne of food produced a further tonne of potential biomass is produced. This consideration also applies to forestry, where only 50% of the total tree biomass is harvested. In developed biomass energy markets crops are increasingly being grown with this dual functionality in mind.

12. In addition to the processing co-product arising from the primary processing of wood or food crops, there is also potential to recover biomass which enters the general waste stream. Assuming recycling targets are met in full, the biomass content in the municipal solid waste and industrial and commercial wastes is estimated to be 18.8 and 24.4 Mt respectively[1]. Furthermore, biomass is traded internationally at quite large scales.

13. A review of a number of recent studies[2] on the availability of biomass for heat and electricity production suggests a total resource in excess of 25 Mt per annum, delivering carbon savings of over 10 MtC. These findings are summarised in Table 1 below.

Table 1 Summary of Biomass Resources and Carbon Savings Potential

	Resource (Mt)			
	UK Mt	*Imports Mt*	*Total Mt*	*MtC Saved*
Energy Crops	1	—	1	0.4
Harvesting co-product	7	1	8	3.52
Processing co-product	2	1	3	1.32
Recovered biomass	10	—	10	4.4
Manures and sludges	4	—	4	1
Total	24	2	26	10.64

14. This analysis assumes no changes to current land use patterns, no increase in current import levels and assumes best practice in conversion technology. It demonstrates that the principal constraint on the exploitation of biomass to address climate change objectives is not the availability of resource but the lack of effective policies to deliver effective market development.

15. Government's recently conducted feasibility study determined that in the transport sector, a Renewable Transport Fuels Obligation could deliver 1 Mt of carbon savings per year by 2010. Supplies of fuels at the level of 5% of total road fuel sales could be achieved through production from current crop surpluses.

16. A more ambitious quota, in line with EU guidance under the Biofuels Directive, would increase carbon savings to over 1.5 MtC per year. However, the level of ambition in the Government's target has been constrained by the relevant technical standards that limit biofuel content within the standard specification diesel (EN590) and petrol (EN229) fuels to 5%. Increasing these limits would rapidly allow biofuels to meet 10% of our road transport needs. A number of motor vehicle manufacturers are already supporting such a move.

17. In the power sector, biomass remains the single largest contributor to the Renewables Obligation (RO), one of Government's key instruments to deliver carbon savings in the power sector. In 2004–05, biomass generation accounted for 63% of power produced, of which landfill gas accounted for half. In the future, limits on co-firing of biomass with coal and other fossil fuels will restrict further development of this important opportunity; from April 2006 co-firing will account for a maximum of 10% of power generated under the RO, dropping to 5% by 2011.

[1] Quantification of the potential energy from residuals in the UK. ICE and RPA, March 2005.

[2] Biomass Task Force: Report to Government, Biomass Task Force, October 2005 updated by REA to include WRAP data on recovered biomass and industry data on imports.

(2) *How cost-effective are biomass and biofuels in comparison with other sources of renewable energy?*

18. It is difficult to provide a simple response to this question. In contrast to many other renewable energy technologies, which exploit a free resource such as wind, currents and the sun, most biomass-based energy systems depend upon a feedstock which itself has some economic value or cost. Hence the cost-effectiveness of any biomass-based technology or energy system will be tied not only to the value of the end-product and the capital, operating and maintenance costs, but also to the cost of primary energy input, be it forestry offcuts, energy crops or rapeseed oil, for example.

19. In this respect, many biomass technologies are much more akin to conventional fossil fuel-based technologies insofar as the plant economics are driven by the relative costs of the energy inputs and the delivered energy output. There is, however, a crucial difference, in that conventional fossil fuel plants enjoy a natural "hedge", whereby increases in the price of fossil fuel inputs will generally feed through to the market price of the outputs and thus protect the investment. There tends to be no such correlation between input and output prices for a biomass system. For example, the fossil diesel price may fall in response to geo-political factors, while the rapeseed oil price may rise in response to the failure of the US soybean crop.

20. In any consideration of cost-effectiveness it should be recognised that biomass technologies offer some advantages over other renewable technologies, the benefits of which may not be economically costed. For example:

— Biomass power plants enjoy similar flexibility and dispatchibility to other thermal power plant, delivering a degree of system security that is not obtained from some other renewable technologies. Owing to their relatively small scale, current approaches to network operation may not recognise this value. Their biomass feedstocks can be stored to provide additional capacity at times of maximum system demand.

— Liquid biofuels enjoy the benefits of portability, owing to their high energy density and flexible handling properties, which rightly command an economic premium.

— Biomass can bring positive impacts for the development of the rural economy.

21. It can be misleading to appraise biomass technologies and energy systems in terms of a simple measure of relative cost-effectiveness. To do so fails to recognise the specific technological and commercial circumstances facing different technologies and the relative maturity of the markets in which they operate. Some specific considerations for different biomass applications should be highlighted:

— In the case of dedicated biomass power plant, and in particular those based upon wood fuels, commercial viability continues to fall some way short of some other renewable technologies, specifically onshore wind and landfill gas. For these biomass plants, many of which employ established technologies, improved viability will be driven primarily by declining fuel costs and more effective targeting of Government support.

— By contrast co-firing, for which capital costs represent a relatively minor element of project economics, is viable under the RO for a wide range of fuels.

— In general terms, heat from biomass is competitive on a fuel to fuel comparison with fossil alternatives largely, because of the efficiency of the conversion (in excess of 80%). However owing to the immaturity of the market capital costs are still nearly three times those of the fossil alternative.

22. The development of an efficient and functioning market is an essential precursor to the introduction of more advanced technologies, since no investor will contemplate entering a market faced with the dual risks of untested technology and an immature market. Although established technologies may not optimise resource efficiency or carbon abatement in the short term, they nonetheless contribute to this objective by helping to establishment stable market conditions for the longer term. For instance, 2nd generation biofuels technologies are unlikely to be developed commercially until such time as the feedstock supply chains and end markets for biofuels are established. Policymakers and other stakeholders must recognise that while the mix of technologies and markets currently exploiting biomass may appear sub-optimal, this is an essential stepping-stone towards achieving long term efficiency.

(3) *How do biofuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?*

23. The life cycle emissions of most biomass and biofuel production chains are increasingly well understood but owing to the wide range of production chains comparisons should best be made on a case by case basis. Furthermore care must be taken in drawing conclusions from such studies, since:

— although studies have tended to adopt a broadly similar lifecycle assessment methodology, different studies may not have applied a consistent set of assumptions or system boundaries.

— many fossil fuel production chains have not been extensively studied so current data often understates the overall life cycle impacts of the fossil equivalents.

24. Most authorities assume biomass is carbon neutral but this is not strictly the case as there is always some "leakage" owing to the use of fossil fuels in the production, processing and transport of biomass/biofuels. Contrary to popular belief however the level of leakage is relatively small in comparison with the offset effects. To illustrate we can take some of the key chains.

25. A direct comparison between biomass and wind electricity shows that biomass emissions are about 72gCO_2eq/kWhe whereas wind emissions are about 10gCO_2eq/kWhe against an average emission level of 645gCO_2eq/kWhe for conventional electricity supply. In other words biomass electricity saves 573gCO_2eq/kWhe against a figure of 635gCO_2eq/kWhe for wind[3].

26. When biomass is utilised in the co-firing scenario, where biomass displaces coal on a tonne by tonne basis, coal emissions are 1054gCO_2eq/kWhe and the overall offset is 982gCO_2eq/kWhe. Under this scenario the overall transport emissions for biomass are 17gCO_2eq/kWhe or 1.7% of the total offset[4].

27. In an average biomass heating scenario overall fossil heating emissions are 300gCO_2eq/kWh and the biomass emissions are about 30gCO_2eq/kWh making the overall offset 270gCO_2/kWh[4].

28. A summary of studies[4] estimating the reduction in greenhouse gas emissions from biofuel use illustrates the considerable variation observed between different approaches, reflecting differences in methodology and assumptions. These data are presented in Table 2, and demonstrate the risks of drawing direct comparisons between the results of different studies.

29. Notwithstanding these risks, it may be useful for illustrative purposes only to present some comparison of GHG emissions abatement performance for bio- and fossil fuels[5]:

— Typically biodiesel delivers overall emissions of around 60gCO_2/km on a full life cycle basis, although certain recovered feedstocks have been demonstrated to present a significantly lower life cycle impact[6]. Using a similar full life cycle approach fossil diesel is at 165gCO_2/km.

— Bio-ethanol production chains tend to show a wider variability ranging from 45gCO_2/km—140gCO_2/km depending on crop and production system. Using the agreed full life cycle approach average petrol emissions are 220gCO_2/km and full hybrid cars are currently emitting 160gCO_2/km.

Table 2 Reduction of GHG Emissions for Biofuels from Different European Feedstocks as Compared with Fossil Fuel Emissions

Source	*Bioethanol from Sugar Crops*	*Bioethanol from Grain*	*Biodiesel from Rapeseed Oil*
VIEWLS—today[7]	20–73%	minus 21% to plus 32%	18–64%
VIEWLS—for 2010[7]	35–72%	16–64%	7–74%
Sheffield Hallam[8]	47–54%	62–67%	51–55%
Imperial College[9]	minus 11% to plus 63%	5–68%	48–80%
Concawe/Eucar/JRC[10]	37–44%	minus 6% to plus 43%	16–62%
PWC[11]	40–60%	40–70%	50–70%
IEA[12]	34–55%	18–46%	43–63%
ADEME[13]	75%	75%	74%

Source: European Commission, February 2006

(4) *Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?*

30. Since the rationale for Government's intervention to support biomass and biofuels is to some degree linked to the objective of carbon abatement, it is appropriate that efforts are made to encourage the development of supplies that incur lower GHG emissions. Incentives should be developed in such a way they operate in an holistic manner and optimize carbon savings across the entire supply chain.

[3] Royal Commission for Environmental Pollution—Biomass as a Renewable Energy Resource 2004/ETSU studies for the DTI 2000.

[4] An EU Strategy for Biofuels, COM(2006)34, Commission of the European Communities, Brussels, February 2006.

[5] World Business Council for Sustainable Development—Sustainable Mobility Project 2004.

[6] Life Cycle Assessment—study of Biodiesel from Tallow and Used Vegetable Oil, Niederl.

[7] Environmental and Economic Performance of Biofuels, VIELS, 2005.

[8] Sheffield Hallam University (aggregation of various work by Nigel Mortimer).

[9] Imperial College, London (aggregation of various work by Ausilio Bauen/David Hart).

[10] Well-to-Wheel analysis of future automotive fuels and power trains in the European context, Concawe, Eucar, JRC Ispra, 2005, http://ies.jrc.cec.eu.int/WTW

[11] Biofuels and other renewable fuels for transport. A study commissioned by the Federal Public Service of Public Health Food Chain Safety and Environment, Brussels, Belgium, Price Waterhouse Coopers, 2005.

[12] Biofuels for Transport: An International Perspective, IEA, 2004.

[13] Bilans énergétiques et gaz de serre des filières de production de biocarburants. Rapport techique, version definitive, ADEME/PWC/DIREME, November 2002.

31. Assurance schemes have proved an effective means of safeguarding standards and improving performance of certain sensitive parameters for other supply chains in the agricultural sector. Such an approach could potentially be adopted in the biofuels sector, although any such approach must be applied judiciously. In particular, any such scheme must:

— *Take account of the international nature of markets*. A wide range of biomass feedstocks are traded internationally. Similarly, there is effectively a pan-European market for refined biofuels. Unilateral standards that increase relative costs in the UK market risk increasing costs to UK producers and consumers and may simply displace into other national markets any product that fails to comply with UK standards, with no net environmental benefit.

— *Avoid confusing distinct policy objectives*. Straightforward and transparent incentives will be required in order to attract the investment necessary to stimulate the development of the UK biofuels market. At the same time the Government is seeking to encourage sustainable production practices and drive increasing levels of carbon savings from the supply chain. Although these objectives are complementary in the long-term, they are distinct and care must be taken to ensure that measures introduced to deliver these outcomes do not conflict in the short-term.

— *Balance cost and benefit*. An appropriate balance should be struck between delivering improved performance on one hand and minimizing regulatory burden on the other. It would prove counter-productive to the development of an important carbon-abatement opportunity if costs which are not proportionate to the identified risks were to undermine the wider commercial viability of the biofuels sector.

32. In respect of the above, Government must be satisfied that any assurance standard represents the optimum approach. While the motivation of improving environmental performance is entirely appropriate, it must be demonstrated that this outcome would not otherwise be delivered through normal, efficient business practice. It should also be demonstrated that the desired outcomes could not be delivered as effectively through alternative means; the Government is, for example, already proposing to introduce Enhanced Capital Allowances as an incentive to lower-carbon biofuels production processes. Where there is a demonstrated requirement for some sustainability standard or assurance it should be introduced on an EU-wide basis.

33. The above comments have drawn specifically on the case of biofuels. However, similar considerations apply in respect of other biomass energy supply chains.

34. It is apposite to observe that while there is merit in striving for higher standards of environmental performance in respect of biofuels and biomass, there is an evident inequity with respect to the supply of fossil fuels, which do not face similar constraints. For instance, the energy inputs and carbon emissions associated with natural gas supplied direct to the UK from the UKCS will be at some variance from imported LNG which has been extracted, liquefied, transported in refrigerated carrier, and regasified before entering the National Transmission System. It is notable, that in conducting its analysis of carbon savings across the biomass sector[14], the Carbon Trust observed that "additional emissions for fossil fuels [due to extraction, processing and transport] are significant and of the order of the net emissions of biomass".

(5) *What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and biofuels?*

35. EU actions predominantly take the form of "framework" Directives. At present, framework Directives are in place to promote the production of electricity from renewable sources and the production of biofuels. There is no parallel legislation in place to promote the development of a renewable heat market, although such a measure is proposed in the recently Biomass Action Plan recently published by the European Commission[15] and is very much welcomed by the Association. The UK Government should actively support the initiative of the Austrian Presidency in driving forward a framework to support the development of renewable heat.

36. Framework directives can fulfil a useful function, in providing impetus to the development of national policies and measures and in holding Member State governments to account. However they are generally toothless in themselves, and can be considered to have little direct impact in the face of inertia on the part of national Government.

37. The EU is likely to have a more significant role to play in respect of fuel standards for biofuels. The [Fuel Standards] Directive has a direct impact on the relevant standards for gasoline and diesel fuels, EN228 and EN590 respectively, limiting the biofuels content in both standard fuels to 5% by volume. Since motor vehicle manufacturers will only warranty their vehicles for use with fuels which meet the relevant specifications, these standards effectively limit the growth potential of the EU biofuels market.

[14] Biomass Sector Review for the Carbon Trust, The Carbon Trust, October 2005.

[15] Biomass Action Plan, COM(2005) 628 Final, Brussels, 7.12.2005 http://europa.eu.int/comm/energy/res/biomass_action_plan/doc/2005_12_07_comm_biomass_action_plan_en.pdf

38. Since these standards apply on a pan-European basis, and since motor manufacturers will seek to develop vehicles for a common European market, it is only at a European level that the necessary changes can be made to fuel standards necessary to accommodate higher levels of biofuels. The EU has a major contribution to make in providing the impetus for this change.

39. Actions by the UK Government vary considerably, in terms of both scope and impact.

40. Within the power sector, the co-firing provisions under the Renewables Obligation [reference to Renewables Obligation Order 2003] have proved extremely successful in driving demand for biomass supplies and driving technological development in power plant. However, stringent conditions have been applied to co-firing, with a) a narrow definition of energy crops effectively requiring the use of perennial crops and b) restrictions on the use of other biomass feedstock imposed from April 2009. These constraints fall inside the planning horizon for planting some energy crops, thus stalling co-firing operations. This facet of the RO will constrain this significant carbon abatement opportunity at a time when operators are proving the considerable technical potential of co-firing, and when this approach is emerging as among the most commercially viable of today's renewable power technologies. These restrictions will act to further constrain the development of indigenous biomass supply chains.

41. The DTI's Bio-Energy Capital Grants scheme has sought to provide additional incentives for the development of "stand-alone" biomass-fired power plant, CHP and heat-only plant. However, this scheme has sought to place a disproportionate emphasis upon advanced power generation technologies that face major challenges in raising finance irrespective of the level of capital grant, owing to their technical risk and the risks in contracting for feedstock. As a consequence the scheme has failed to contribute either to the advancement of biomass generation technology or the development of a biomass supply chain.

42. The impact of policies in the fuel sector remains to be seen. Existing fiscal incentives, of duty relief at the rate of 20 pence per litre of biofuel supplied, have had only limited impact in driving demand for biodiesel. The same incentive, however, has boosted imports of bioethanol, such that biofuels now meet 0.3% of fuels supplied into the UK road transport fuel pool. A more significant impact is expected with the introduction of a Renewable Transport Fuels Obligation (RTFO), to be introduced in parallel with a package of Enhanced Capital Allowances (ECAs) that will maintain incentives for producers to adopt lower-carbon processes in the delivery of biofuels to market. Details of the design of the RTFO, due to be introduced in April 2008, will determine its efficacy. The somewhat relaxed programme for the introduction of ECAs, scheduled for April 2007, risks delaying the investment necessary to meet the demand that will be presented by the RTFO.

43. In the UK, as for the EU, there is no coherent policy in place for the promotion of renewables to meet the demands of the heat market. This is in spite of a series of Government-sponsored analyses, including studies by the Carbon Trust and Future Energy Solutions, along with reports from the Royal Commission on Environmental Pollution and more recently the Biomass Task Force, that highlight the considerable benefits that could be realized at relatively low cost from initiatives in this market.

(6) *What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?*

44. There is no simple level of support for technologies that could be sensibly described within the scope of this response. As emphasised previously, different energy sources, different fuel chains, different applications and different markets impose their own constraints that will impact the level of support required. The mechanism by which any support is delivered can also represent an equally important consideration in addressing the inherent constraints of the market and supply chain.

45. The Renewables Obligation provides an important illustration:

(a) Since much of the value of support is obtained via highly uncertain revenue streams, many projects seeking finance under the RO regime lack the capacity to raise sufficient levels of debt and hence achieve a viable return to equity.

(b) The application of co-firing rules under the RO, with minimum content of energy crops required from April 2009, has limited the opportunity that could have emerged to provide long-term incentives for the domestic production of energy crops.

(c) The skewing of incentives under the RO towards the production of electricity has inhibited the development of biomass CHP or even heat-only schemes that may have presented a more efficient option for the utilisation of the biomass and delivered greater carbon savings.

46. As a consequence, the RO has failed to provide an effective incentive for biomass power generation other than co-firing, delivering neither the absolute level of support nor the security of revenues necessary to bring forward investment in any significant number of projects. These failings could be addressed through more effective targeting of the support available under the RO or possibly through introduction of Enhanced Capital Allowances. Measures to deliver greater efficiency and cost reductions in the supply chain would also prove beneficial.

47. For biofuels, estimates of levels of support again vary with feedstock, process and the related supply chain. Government's analysis suggested that levels of support of c.30 pence per litre (ppl) of fuel supplied will deliver investment in infrastructure and secure supplies from a mix of domestic production and imports. However, the price volatility in both fuel end-markets and feedstock markets suggests that investors will seek the prospect of higher levels of support in order to protect their investment. More recent analysis undertaken by the REA suggests somewhat higher levels of support—34 ppl for rape methyl ester and 40 ppl for grain-based ethanol—would be required to fully mitigate the risks presented by sustained adverse movements in the oil price and recent movements in feedstock prices.

48. The support necessary for heat is highly dependent upon the application and scale of installation. The Carbon Trust has shown that at current oil prices only small heat applications (c.2 MW) will prove commercially viable, whilst larger heat installations will continue to require elevated levels of support. Similarly different mechanisms will be required to reflect the different nature of the small and larger heat markets, the former being predominantly residential and commercial, the latter increasingly industrial.

49. The Biomass Task Force recommended the urgent introduction of a common capital grant scheme, providing grants fixed at 40% of capital expenditure for boiler or CHP equipment. Recognising the diverse nature of the market this is a pragmatic and straightforward approach that delivers an appropriate level of support to the market for the short- to medium-term.

(7) *What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?*

50. Any such impact will prove to be highly dependent upon the efficacy of the policy measures employed to drive demand for biomass and fuels in the energy and transport sectors, and upon other pressures for agricultural land use. Interactions between these pressures are likely to prove complex, but may prove complementary in some instances.

51. Certain crops, notably oilseeds, are driven by demand in both the foods and the fuels markets. Both are international markets, and it may be difficult to isolate competitive effects or ascribe impacts to either the UK or EU market alone, or to one single end-use.

52. Certain crops may meet demands from a number of complementary markets, for example a crop such as wheat, grown primarily to provide grain to the food industry may provide straw as a by-product to the energy market. Conversely a crop grown primarily as an energy crop may provide an animal feed product, such as seed cake from oilseed rape.

53. With improvements in technology, agricultural practice and crop varieties it will become increasingly likely that whole crops may be utilised to meet the demands of the energy market. Effectively this will increase energy yields and may serve to mitigate a number of the adverse impacts highlighted.

(8) *Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?*

54. Strategic sectors of the economy such as agriculture and energy will remain subject to significant Government intervention, and a somewhat complex pattern of incentive and subsidy will invariably arise. Under circumstances of EU over-production in many traditional food markets there is a strong case for a switch in production into non-food crops, and with the benefits afforded in respect of greenhouse gas abatement there is a compelling case for the production of energy crops. However, in the context of the pattern of support described, it is clearly the role of Government to determine whether and how far to intervene to support energy crop production is appropriate. The principal concern of parties throughout the supply chain is that any measures introduced by Government are effectively targeted, applied consistently and are enduring, and that any shift in policy is properly signalled ahead of time.

55. There is certainly a case for a diverse pattern of energy crop supply, that embraces both domestic production and imports. Domestic production can be considered to provide some insulation from external price and supply shocks, but with commodity markets becoming increasingly globalised any such benefit may prove difficult to achieve in practice. For domestic producers, notably biofuels, there are advantages in accessing a global market both in terms of securing the best price for the product and minimising exposure to single-country risk. While there may be some benefits in protecting domestic production, particularly at an early stage of market development, the long-term benefits are probably maximised under a truly diverse, global pattern of supply that may encompass biomass, biofuel feedstocks and refined biofuels. As described previously, it should be possible to establish adequate safeguards for the sourcing of both imported and domestically-produced commodities that meet appropriate environmental criteria.

(9) *What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?*

56. The single most significant move would be a more appropriate classification of biomass co-products under the Waste Framework Directive and the Waste Incineration Directive (WID). Presently, the costs of WID compliance prevent the economic utilisation of a range of appropriate and relatively low-cost feedstocks, and the classification of some biomass-derived materials as wastes can also create regulatory barriers to their use. Such a move has been suggested by the EC in its Biomass Action Plan which states that waste is an underused energy resource. The Plan argues that options that make it easier for recovered materials to be used energy purposes, such as developing technical standards to enable them to be considered as goods, are to be considered by the Commission in its preparation of a proposal on the revision of the waste framework legislation.

57. The by-products of forestry represent a vastly under-utilised resource. However, the availability of a feedstock that is considered relatively low-cost should not lead immediately to the introduction of production-based incentives. It is imperative that support measures are primarily demand-side based in order to ensure that incentives can apply across the entire supply chain. Recognising that a perceived lack of a reliable supply chain is often seen as a constraint on investment in the sector, then simultaneous activity to support development of these supply chains is appropriate. However effective demand-side measures must remain a pre-requisite for policymakers.

(10) *What lessons can be learned from other countries' experience in the production and use of bioenergy?*

58. The most important lessons to be learned in respect of other countries' experience can be summarised as follows.

- Development of bioenergy production and supply must be underpinned by robust measures to stimulate demand. Demand-led policies will prove more effective in establishing stable and enduring market conditions than producer-led policies.
- Policies must be coordinated, such that investment in the supply chain occurs in tandem with the development of market demand.
- Governments must maintain a consistent and enduring policy framework.
- Maintenance of straightforward or singular policy objectives. The establishment of a viable market and functioning supply chains must be built upon the foundation of established, commercially-viable technologies.

59. Practical illustration of these approaches is evident in the French Government's fostering of the biofuels sector. France has introduced a straightforward framework of production quotas, specifying annually the volume of biofuels that will qualify for tax incentives. Production in 2005 was 504 kt with 2007 quota set at 880 kt. The Government has announced that the use of biodiesel is set to rise from the current 5.0% to 5.75% by 2008, 7% by 2010, and 10% by 2015[16].

60. In Upper Austria, a coordinated programme of activity to improve energy efficiency, install wood-fired boilers and develop the woodfuel supply chain, backed up by clear political commitment, saw the proportion of energy supply from renewable sources rise from 25% to 30% between 1993 and 2000[17]. Capital grants were a key element in the programme that saw the installation of 15,000 modern wood-fired heating systems.

Renewable Energy Association (REA)

February 2006

[16] GAIN Report Number: FR6005 France—Oilseeds and Products—French Biofuel Production Booms—2005, USDA Foreign Agricultural Service, 20 January 2006. http://www.fas.usda.gov/gainfiles/200601/146176605.pdf

[17] Regional implementation of small scale biomass in Upper Austria, O.Oe. Energiesparverband, Austria. http://www.managenergy.net/download/nr39.pdf

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Witnesses: **Mr Graham Meeks**, Head of Fuels and Heat, Renewable Energy Association, **Mr Ian Calvert**, Government Relations Manager, British Sugar, **Mr Stewart Boyle**, Business Development Manager, Wood Energy Ltd, and **Mr Graham Stowell**, Managing Director, Bronzeoak, gave evidence.

Q43 Chairman: First of all, may I thank you for your written evidence. May I welcome the representatives of the Renewable Energy Association and apologise for the slight delay in your coming on to be our witnesses. For the record, can I welcome Graham Meeks, the Head of Fuels and Heat of the Association, Ian Calvert who comes from British Sugar, Stuart Boyle from Wood Energy Ltd and Graham Stowell from Bronzeoak. Can I start our questioning with you in the same way as I did with the NFU, which is to ask you very straightforwardly what is good about Government bioenergy policy and what is bad?

Mr Meeks: First of all, thank you very much for the invitation to come and give evidence. The colleagues I have with me today have been selected to represent

some discreet areas of the industry, from heat, power and fuels. What I intend to do is to direct questions to the expertise that is there. Returning to your question, the principal problem we have today is that the significance of biomass in contributing to our carbon abatement targets, our climate change targets and also, increasingly, to the question of fuel security has simply failed to be recognised and given the significance that it probably deserves. If one looks at the current concerns that we have, for example, on the security of gas supplies, if we are to believe the line the Government has taken, the Energy Review has been predicated on the assumption that our electricity supply mix by 2020 will become something like 60% gas powered and something like 60 to 70%, maybe even higher than that, of our gas supplies will be imported from unstable sources overseas. If we take a step back and look at our heat supply in the UK at the moment, 90% of our heat in our homes today comes from natural gas. If we look at the industrial and commercial sector, 55% of the heat supply comes from natural gas. If we have got a looming problem with natural gas in 2020 in the power sector, we have got a real problem today. A lot of the institutional structures that we have today simply fail to take into account what the heat market is, what the transport fuels market really is and how biomass can necessarily be used to address the concerns of climate change and fuel security right across our energy economy.

Q44 Chairman: Can you define in simple terms how you would like to see the Government's review of their climate change programme and the Energy Review that is going on address the deficit as far as the use of biomass is concerned? If you had a free hand in designing what the words would be, what would you write down?
Mr Meeks: First of all, we need to move away from a narrow attachment to looking at energy supply simply as how we deliver network utilities, electricity and gas, and begin to approach it in a far more holistic way in which we look far more at the energy services and how those can be delivered by taking advantage not only of indigenous sources but a far greater variety of energy sources. Biomass clearly has a major contribution to make in terms of an energy source if we look at it as another competing energy source alongside gas in the heat market and alongside other renewable sources, fossil sources and nuclear in the power sector and also, of course, in transport fuels. If we were to look at the enormous opportunity and resource that is available, not only with the current first generation biofuels which tend to use higher value starches and oil seeds to provide the source, but then we go to second generation biofuels where there is a whole host of technologies which could be used in parallel and in a coordinated manner with other energy systems to provide a far more efficient overall energy system, I think the root of this is really taking an holistic approach.
Mr Boyle: We have a policy at the moment to go for 60% carbon reductions; that is official Government policy. There is a longer aspiration to go beyond that. No one who has seriously looked at this believes that we can get there without a substantial role for biomass because what biomass addresses is the fuel aspect, the heat aspect and quite clearly the base load issue on the power side. It is recognised beyond a certain level with the intermittent renewables that you need some base load and biomass provides that possibility. At the moment that is not fully recognised in the policy-making systems that are there. There are additional qualities that you can give that. In my own area, in heat, it is as though it does not exist. There are major support mechanisms for power, some belatedly coming along on the liquid fuels side and really nothing on the heat side. So a whole third of the energy equation, which provides big opportunities for reductions, at the moment is largely ignored. So there is a lot of work to be done.

Q45 Chairman: Why is it ignored? The Government would argue that they appointed Sir Ben Gill to produce his report. I am sure they would say if they were here—I am not a spokesman for the Government—they did recognise it and they have produced a report.
Mr Boyle: That is absolutely right. In that report you will find a great deal which echoes the criticisms that we have just talked about and they have given a recipe of policies to move out of that. There are four or five working groups at the moment due to report in April. The proof of the pudding will be in those recommendations and what the Government does. So far there has been one single recommendation addressed, which is to reduce VAT on biomass boilers from 17.5 to 5%.

Q46 Chairman: Who are these working groups?
Mr Boyle: They are inter-governmental working groups, Defra and the DTI mainly, with some other experts brought in. They are looking at fuel infrastructure and policy mechanisms right across the range.

Q47 Chairman: Is that the sum total of their output to date?
Mr Boyle: Well, to be fair, they are on a fast track to report within six months. Ben Gill reported in late October and they will have until April.

Q48 Chairman: So we have a dual line of inquiry by the Government. Are they following on or paralleling Sir Ben's report?
Mr Boyle: The interesting thing about this is it has become a little bit Kafkaesque here because the climate change strategy is 20 months late and counting. The problem with that strategy is that there is always another report from a different sector coming along which then leads to a delay in the climate change strategy, which then leads to the excuse that because we are behind in our targets and we are missing all sorts of things we had better wait for the biomass task force or we had better wait for that review on wave and tidal, it just keeps being put back. In a way you are putting off the inevitable, which is to face up to the fact we are not hitting our

carbon targets, we need more intervention and we have got to do more. We need to bring that to a head and realise there is an end point here, acknowledge what has not worked and bring in what needs to happen and then we can move forward.

Q49 Patrick Hall: I am not sure about the distinction between power and heat because electricity is used to generate heat and gas is used to generate electricity.
Mr Boyle: Obviously to provide low grade heat, such as heating this room, or process heat for industry et cetera you can use a variety of sources. At the moment that is dominated a lot by gas in the domestic sector and 55% in the industrial sector. You can use electricity for heat. It is a very, very small part of the market because it is a very inefficient and expensive way of providing heat. Electricity is mainly for the high quality end: lighting et cetera. You have got a few buildings where there are storage heaters and so on, but anybody who has paid the bills for those knows it is pretty expensive.

Q50 Mrs Moon: You talked about the Government always being on the back foot and it never actually getting there. Where do you see the hold up as being? Is there a particular department that is slowing the process down? Sometimes I feel that Defra has all the targets, but the actual changes that we are looking for are often with other departments like the DTI and the ODPM. Where do you think, if you pulled that plug, we would see some movement?
Mr Meeks: I think you have hit on the problem in that it seems to be the case that responsibilities are spread too thinly across too many departments and it therefore bears too small a significance within each of their respective portfolios and so it simply does not receive the attention it is due. I think if you put it in a single department you may begin to see that it enjoys a greater significance with respect to the ministerial brief, but unfortunately with the responsibility spread fairly thin we do not reach that. We see that DTI has responsibility for power and so they will begin to look at biomass applications in the power sector. Defra appear to have inherited heat because of the upstream issues of fuel supply and also the legacy of combined heat and power which for some reason has always fallen outside of DTI's gift and within Defra's, so they then have part of the picture to deal with and, of course, the Treasury will always have an interest in economic efficiency. In some respects, even though they may be willing to pursue this, again it is not a significant part of the respective departments' brief to then go in to bat with the Treasury. I would also add that ODPM has an incredibly important role to play in this and they are consistently found to be a very difficult department to deal with, particularly with some of the more local solutions which tends to be the optimum, certainly for biomass power and also biomass heat. It really requires the coordination of activity at a local level to create the market. The ODPM is a very jealous defender of the interests of local authority budgets and it will resist fiercely anything which they see as in any way imposing additional costs. As a result of that in particular I would say biomass, which requires a local intervention as well as a national government one, falls foul of the ODPM's very strong defensive tactics.

Q51 Mrs Moon: So the big barrier is the ODPM, is it?
Mr Boyle: I think it is a bit more complicated than that. You have put your finger on one of the key problem issues for our sector, which is that it is disparate, disjointed and incoherent. For a long time the DTI has simply not understood heat. For the DTI energy means power. Unless it is 10 megawatts you do not go into a meeting. So it is small scale stuff, particularly with heating. Why is that? If you look at where the allocations and the sources are, traditionally that has been the case. That is a reality. On the heat side and on some of the smaller scale biomass side it has been difficult to find a champion. At the end of the day you are trying to change infrastructure which has been geared up for the lowest possible price, conventional fuels et cetera. You are trying to redirect that with carbon reduction and other objectives are coming into play. There is a lot of resistance to that. There are a lot of pressure groups writing to you saying not to change anything. In my sector we have the Chipboard Association that will write in to you and say we cannot have too much wood fuel as it will put the price up for them. With every change there is someone who does not like it. Within that you need champions. At the moment if you asked where is the champion for biomass, there is no one department that you could point to and say that is the place it should be, because the responsibilities are split right across three or four departments. We must not forget the Treasury, of course.

Q52 Mr Drew: I want to look at one of the key levers which is the Renewables Obligation. I would welcome your views on the efficiency of this particular means to impose changes on the energy suppliers. More particularly, I have been interested in the dysfunctionality of the Renewables Obligation Certificates which were a fine idea and may be working a bit better, but, of course, the whole market almost fell with the collapse of TXU. What are your views on that workability if you like?
Mr Stowell: The Renewables Obligation has had a certain amount of success. It has encouraged us to develop a full capacity for landfill gas. It has certainly encouraged onshore wind to come onstream and it has been successful with co-firing. What it has not been successful in dealing with is other technologies, such as biomass and then the other offshore and more expensive ones, ie wind, wave, tidal and solar. To my mind there is an inflexibility when it comes to biomass in that it does not recognise some of the other benefits not only just in the rural community but in being able to present base load capacity at the end of transmission lines. It helps reinforce the system and so on. Those benefits are not valued in it. This difficulty of getting biomass, which is just behind the crest of a wave really in terms of the economics, and its applicability

under this system, is not really encouraging capacity to come through. You have hit on one or two of the issues which cause a problem. In order to have the development of small to medium-size projects, which are the ones that are replicable throughout the country, with definable catchment areas of feedstock, and to be able to finance these projects, one does need to have a certainty on the value of the output, electricity and ROCs and it has been very difficult for developers of such projects to get good long-term contracts for the sale of electricity without leaving a lot of value on the table with the purchasers. So it has been quite difficult to get a financing scheme together with the uncertainty of what is going to happen longer term. You are talking about long-term investments here, you are looking for debt terms of 10 years or more and it is very difficult to establish those long-term values in order to be able to finance projects. So there are constraints on the RO system.

Q53 Chairman: Can I just stop you, Mr Stowell, because you have painted a little word picture which I have been following with enthusiasm. You have been talking about medium-size projects doing a certain something or other. Can you turn that into something tangible that I can understand?
Mr Stowell: With biomass power you could be looking at anything from a few kilowatts up to 50 megawatts or maybe a little larger in terms of the output of projects. Now, one or two of the larger projects have gone through with capital grants and so on. By going through I mean they have reached financial closure and they are being built. We are talking about 25 or 40 megawatt projects. The problem with those projects in terms of replicability across the country is that they put a stress on the feedstock supply, on the catchment areas of biomass. My personal belief and my company's belief is that the replicable nature of things in terms of feedstock supply is to concentrate on catchment areas of 20 or 30 miles radius, which means that you are more in the five to 10 megawatt range and those are quite difficult to finance. They are also quite difficult economically because biomass is rather like fossil fuel plants, ie the larger the more economic you get and you get a benefit of scale. You are getting into an area where you have to get all the benefits of the economics you can, on costs of feedstock and so on to make those work. They are not quite there with the ROC values as they are at the moment.

Q54 Chairman: Put simply, unless these plants are subsidised by the payment of the ROC they do not produce power at an affordable price at the end of the day.
Mr Stowell: Not at the price of feedstock which is there in the market at the present time.

Q55 Chairman: And to make the economics work you have got to have a step change up in the size of plant if you are using it as a source for power generation.
Mr Stowell: Yes. You are right, there are step changes in the sizes of technology that you use. The bigger projects do not necessarily suddenly become viable, because the distance you have to bring fuel to the plant increases and therefore the costs of fuel increases the larger you get. So there are lots of dynamics in the economics of these projects.

Q56 Chairman: Do you think that influences the answer you gave to our earlier question on why this is sounding like it is in the all too difficult column?
Mr Stowell: It is difficult. I would say, however, that some of the earlier and more successful projects under NFFO[1] were biomass projects and indeed at the moment more ROCs are produced from biomass, if I include landfill gas and co-firing, than there are from wind or any of the other renewables. So it is a major renewable energy technology that does need to continue to be encouraged, but I do have a problem. You asked about Government Departments. The DTI has put biomass into their 2020 targets as a technology which I think is very false and very discouraging for the industry.

Q57 Mr Drew: This is quite complicated, but in a sense when we many years ago went to Denmark to look at the upsurge in interest in wind there, one of the things that really stuck in my mind was the fact that they ran it through community engagement. Surely, if it were sold in the right way in rural communities, people would buy into this? This is something that could really regenerate those rural areas that need help and with public subscription, which is seen to be old-fashioned in this country, it could make a reoccurrence if somebody was to drive this forward.
Mr Boyle: I have a lot of sympathy with that view. We are involved with a number of communities on LPG oil which have made the commitment to move forward. In saying that, the decision-making process takes a lot longer because if you engage with the community you are immediately putting six to nine months on the decision-making, in contrast with a single industrial client who, if they had the finance and the economics stack up, could make a decision quite quickly. I think there is a balance there certainly in terms of buying the support of the local community, where local benefits help the management of local woodlands, help generate a few jobs, et cetera, et cetera. The pluses are all there, but I do not think we should be under any illusions that that automatically overnight will change the economics of the framework in which you are operating. At the end of the day you have still got to access capital.
Mr Meeks: If I can just come in on that point. The economic opportunity from the community point of view is likely to come from the feedstock supply, the management of the land, and the logistics that bring the fuel to the project. In terms of financing these projects, particularly if as many of these projects are stand-alone projects using a project finance model, one has to have contracts at both ends of the project,

[1] Non Fossil Fuel Obligation

if you like; one for the supply of the electricity from the project, and also to make that mean anything from the bankers' perspective, you also need to have the up-stream contracts in place for the supply of the feedstock into the project, and both of those need to be with creditworthy, solid counterparties, and at the state of maturity that we have with the supply chain at the moment there is a concern that that upstream supply chain is not able to provide the guarantees that one is looking for to effectively balance the financing of the project.

Q58 Mr Drew: Can I be very clear what do you mean by the upstream supply chain?
Mr Meeks: I mean the contracts to supply the fuel. It is as simple as that. These contracts have to be with a strong, creditworthy counterparty if the project is to attract finance. We are at a stage today where we are transiting, if you like, from where we are today, which is at a very immature stage of the market, to one we would like to be in 10 years' time where these supply infrastructures are mature, they are businesses with a commercial track record, which one could raise money against or for, but we have to get there and we have to find a way of reaching that point. Perhaps one way one could look at that is to look at the way in which the Government might underwrite or guarantee the fuel supplies, to supply the financial underpinning that would allow a bank to lend money to makes these projects happen. That could be a very straightforward way of, if you like, unlocking the credit risk that sits in a lot of these projects.

Q59 Chairman: I would like to take forward this theme because you raised in your evidence in paragraph 17 some issues connected with co-firing.[2] I do not want to go into it now but I would be most grateful for a layman's explanation of what paragraph 17 means because I could not work out what the numbers meant. I have received a number of letters sent to me in connection with this inquiry, one from Renewable Fuel Supply Limited and an interesting letter from Drax, who have written saying that "the decision to reduce the co-firing cap from 25% to 10% of obligation levels was taken as a result of a major review of co-firing." That is a quote from a letter sent to Melanie Wedgbury, who is the Head of External Affairs at Drax, and I am not clear whether this was a letter from the Minister for Energy on this particular subject. First of all, it seems to me that co-firing is one sure-fire success because it is straightforward to do, you have got a plant there, you are going to make an instant impact on greenhouse gas emissions, and yet, according to this letter and the statement from the Minister, the Government have decided to make it less worthwhile or less easy, I am not quite certain, and I hope you will explain to me why they have decided in one area where you have got a winner in 2004 they make it more difficult. I am not clear from the letter and what the Minister says whether this is because it was costing too much money or whether they just decided they wanted to cut back. I do not understand.
Mr Meeks: The decision to set this lower cap on co-firing was taken, I believe, in 2003. It was a year into the introduction of the Renewables Obligation.

Q60 Chairman: Can I just be clear because this is a new territory for me, when we talk about caps, are we talking about the percentage of the burden which can be either in this case by coal and 25% in biomass?
Mr Meeks: The Renewables Obligation requires the electricity suppliers who are obligated to supply a certain proportion of their electricity from renewable sources. The cap that is referring to effectively separates out that obligation and says it can only meet, say, 25% of its obligation through the use of the Renewables Obligation Certificates from co-firing. So if, for example, its obligation in year X was 4,000, let us say, then it would only be allowed to submit 1,000 co-fired ROCs.

Q61 Chairman: Why?
Mr Meeks: I believe the concern at the time—and this is an understanding of the situation—was a concern within government that co-firing would be too successful and would take up too large a proportion of the Renewables Obligation and therefore squeeze out the opportunity for other renewables technologies, and it was almost, if you like, ring-fencing a particular proportion of the obligation to prevent that from happening. At the same time, they wished to balance that against what they saw as the opportunity with co-firing, which was to bring forward domestic energy crop production. They took the opportunity in 2003 to change the RO because the immediate response they got from stakeholders across the industry was that the initial proposals—and even now I cannot remember the detail—would not have facilitated that, so they made a number of changes looking forward—and as I say these changes were introduced to do that in 2003—that would effectively change the role of co-firing as the obligation moved forward. There is the co-firing cap which goes from 25% to 10% this year and in 2009 it would be necessary for co-firers to use a minimum proportion of energy crops within the mix of fuel that they put into the station.

Q62 Chairman: To me as a layman sitting here, it does not seem to make any sense because if you are trying to hit the various targets that you opened up your evidence with, and which we know the Government is trying to achieve, and we know the CO_2 outputs in sum total have risen, not gone down, in the last few years, would it not be the case that you take all opportunities? Is there any evidence you have come across to substantiate the position in 2004 which saw co-firing as a threat? Have you heard of projects where somebody was going to build a wind farm or wave development or something else and who said, "Gosh, we can't do that because of co-firing"?

[2] Ev 17

Mr Meeks: I think there was a wave of optimism that existed in 2002 about the speed with which the market would be able to respond to the signals that were laid in front of it by the Renewables Obligation, and I think we are now reaching a point in 2006 where the reality is beginning to dawn, and exactly the point you make, Chairman, given where we are in terms of the Climate Change Programme Review and the evidence I am sure that that will present about our rather paltry performance in relation to the targets, we need to be pursuing all the opportunities that we have in front of us.

Q63 Chairman: I do not want to lead you in this answer but are you sending a clear message to this inquiry that the Government should look again at these numbers in the light of the reality you have just described?
Mr Meeks: In terms of the way that the RO is likely to stimulate a number of technologies, including offshore wind in particular, which is now facing some increasingly recognised difficulties, the Government really does need to look at how effective the RO is in delivering what it set out to do.
Chairman: Sir Peter?

Q64 Sir Peter Soulsby: Can I take you back again to the question of renewables and heat because this is something you touched on earlier on that has not perhaps had the same degree of attention as the use of renewables for generating electricity. Back in 2004, the Royal Commission on Environmental Pollution was very supportive of a Renewable Heat Obligation similar to the Renewables Obligation for electricity, yet when the Biomass Task Force came to look at that they said it would be "unworkable". How do you respond to that?
Mr Boyle: I was very intimately involved in that and had about four or five meetings with Sir Ben and his fellow members. I think the issue for us is two-fold. One, as a company, a recommendation for a five-year 40% capital grant would do wonders for our business, so on a purely selfish note that recommendation would do a great deal to lift the industry because the current Bioenergy Capital Grant of about 22% is too low to make it a must-have investment kind of decision. So if that is a recommendation, no problem whatsoever. It would do a great deal to stimulate the market. If you look at countries like Austria and Sweden with 10 years plus of capital grants of 35%, it has really led to a massive increase in a sustained big growth industry, which is why they dominate the manufacturing side of biomass boilers. Most of the boilers sold in this country are from Sweden, Austria, Germany, etcetera, because they have got a huge domestic market. However, in the UK we have tended to take an approach on capital grants which is, "Give it two or three years and hope that miracles happen"; then the capital grant programme goes away and, what a surprise, it does not take off. We do not have a track record of the Treasury supporting long-term capital grant support. The worry is that you will not build a sustainable industry with a relatively short-term set of grants and big uncertainty whether after three or four years it all drops away. That is why the discussion on a longer term support mechanism grew because we were concerned that when grants end we will not have built a sustainable industry. Our concern on the conclusion of Sir Ben is that as an Association we are not saying that a Renewable Heat Obligation is the answer; however, we would certainly like the assessment and analysis to be done. Our big concern at the moment is that the Royal Commission certainly did not do any research, the Biomass Task Force did not do any research, the Defra/DTI joint report, which was supposed to look at this, did not do any research, so we are dismissing this without the intellectual capital or time to assess whether it could work or not. Our own view is that there are certainly the ingredients in there and we think it is workable, but the detail has not been done, and certainly a longer term support mechanism to take you beyond the vagaries of a Treasury on-and-off situation, which is no way to build a sustainable low carbon market, should be looked at.

Q65 Sir Peter Soulsby: Who should do the research and over what sort of timescale might that be possible?
Mr Boyle: It is a pity that the opportunity has really been missed with the research that came out of the Energy Bill because there was a commitment by DTI and Defra to do joint research. In the end we ended up with a not great report which looked at how big was the renewable heat market. We could have told them that a year and a half ago. It is pretty big. What we have not got is any mechanism. Clearly DTI and Defra have dropped the ball and I think the research should be commissioned by them because ultimately they have to carry it out. Six to eight months of focused research, with the right set of parameters, will answer, we believe, the bulk of the questions, and then we can have a discussion about it and decide whether it is appropriate to move forward or not.
Mr Meeks: The Department for Transport sponsored the introduction of a Renewable Transport Fuel Obligation and effectively did the evaluation of that in a period that went from, I believe, April 2005 to an announcement by ministers in November of last year. So the focused evaluation, given that all the studies that have been done to provide the basis of evidence have already taken place, could be done in a relatively short timescale.
Mr Boyle: I am afraid there is a little bit of a feeling at the moment by civil servants of "not another obligation". They are very over-worked and I have a great deal of sympathy. They are trying to do a lot more with less people. I have sympathy on a real world sort of level but there is definitely a "not another obligation" approach and that has affected the willingness of the DTI to take on and embrace the concept and approach of a Renewable Heat Obligation.

Q66 Mrs Moon: I am interested that you felt the research should come from Defra and the DTI because the previous evidence we had from the National Farmers' Union was that they wanted local

government to take a lead in this area because they felt that the public sector (and local government was part of it) had the capacity to invest in combined heat and power units that could take the biomass. So why have you gone for that end and the National Farmers' Union would say, "No, it should be ODPM"? Since you are talking about being realistic and "not another obligation", part of the problem that ODPM are obviously faced with is that they do not want a rise in their council tax. How do we square that circle at the same time?

Mr Boyle: This is a little bit apples and oranges. On some sort of obligation which might be placed upon fuel supplies, it has to be national legislation, it has to come from the centre. There may be elements of that where obviously in terms of monitoring, et cetera, at the local level, regional heat targets and so on, you can move down and delegate, but, frankly, where local government is really knocking the spots off central government and showing what can be done in this area is in a very simple initiative that took place two and a half year ago in the London Borough of Merton which said that commercial developments above a certain size will have a minimum of 10% renewables. It got challenged but is now accepted and the GLA adopted it and 52 plus local authorities have now adopted it. It is sweeping the country. That includes any developer of offices, schools or PFIs, all sorts of things. It is not about a local authority saying, "We would quite like you to do a bit of renewables please", and getting into a planning gain discussion. On this occasion this is a box that they have to tick, a minimum level of renewables. That simple policy applied at a local level of planning has done more to increase dramatically the market in renewable heat across the board in solar, biomass, et cetera, because the developers accept, "We have got to do it. Let's get on with it." It is a small additional cost to them. If you have a 400-house development, if you have got to do 10% renewables, it is a tiny marginal cost but you get to the big development. That is where local authorities working at that sort of level are a fantastic lever. Let us move it out 10, 15, 20% and start ramping it up. That is where you will get the real change.

Mr Meeks: From an economist's standpoint they are building developments which are going to be lasting for 20, 30, 40 or 50 years. The fact that these projects may have a very long pay-back if appraised in perhaps a more normal way becomes less relevant. They are creating value, they are allowing developments to proceed, and also they are being implemented in a way that is consistent with the economic lifetime of those developments. It seems a logical way to take it forward and one that should not cost the Exchequer much, if anything.

Q67 Lynne Jones: I find all this conversation very interesting because in the 1980s and 1990s local authorities were busy getting rid of their district heating schemes, for example, which at the time I remember being quite critical of. You have been critical of the Bioenergy Capital Grants scheme and you have expanded on that just now about the fact that it is just a short-term scheme and there has not been the uptake of the money that has been made available. Apart from having a scheme lasting a bit longer, what other changes would you like to see? We have, for example, vast amounts of our local authority housing which does not meet the Decent Housing standard and yet the Government does not seem to be making money available. There is £10 million here not taken up. So what changes would you like to see in the Capital Grants Scheme? There may well be projects that have been given the go-ahead that may not actually take place so what should happen to that funding? The other side of that is whether the stimulation of this investment is going to be sufficient to reduce the cost of capital investment in biomass or are there other areas of work that need to take place to reduce the costs?

Mr Meeks: There are a lot of questions there. The first question on Bioenergy Capital Grants, I would say it has been very much a mixed bag because, as you appreciate, it has covered quite a broad spectrum of technologies from pure power technologies through to heat only and also a range of scales, so I will ask Graham to perhaps start off with talking about the power side of things where it has perhaps been less successful, and I think on the heat side, Stewart, it probably has been perhaps a different story, and that is maybe where the lessons are to be learned. Graham?

Mr Stowell: On the power side, there has been some success with the larger projects which I mentioned before. Where the support mechanism has not been taken up yet—there are a number of reasons for that. Part of that is the economics of biomass and trying to get long-term contracts of fuel supply, but if we look just at the Capital Grants Scheme, there are some constraints there. For a start, the Government has given itself the right to withdraw those before the completion so that does not give banks any confidence. It is a mechanism that means that it reimburses after the money has been spent so the balance of funding needs to fund the whole lot before it gets some money back. Some of those projects, because they were selected by tender and certain criteria, actually have pushed advanced technologies, which banks of themselves find difficult to support, so some of the reasons are not just the money availability but actually the other criteria that go around it. Mr Meeks made a point that one of the issues that we tried to present to help unlock some of these projects, a mechanism whereby we could release private sector not only capital but debt from banks, might be by coming up with a commercial guarantee scheme supported by Government. Nobody has really wanted to get involved with this, although it is a very simple mechanism—and I can say this from personal experience because we have developed biomass and biofuels projects abroad—the Philippines, for example, has managed to do this to enable international debt to come in without any difficulty. I suppose it is not really understanding what it takes to close financing on projects of a reasonable size. We are talking about the £20 million-plus capital cost projects. Those are some of the reasons why it

has not happened. I think there are mechanisms that can make it work. They need to be followed through a little, but they are not terribly difficult to do. It just needs to move the goalposts a little bit.

Q68 Lynne Jones: What have other countries done that has been different apart from having a more sustainable length of time for the availability of the money?
Mr Stowell: In terms of other capital grants?
Mr Meeks: Would it be worth just talking on the other aspects of the Bioenergy Capital Grants Scheme because it has been quite different in the way it has been administered in different sectors?
Mr Boyle: I think in our sector we would probably say six and a half, maybe seven out of ten. The first reasons that it has been different from Graham's experience on the power side is that it has been ring-fenced for companies so you do not have to go bespoke for a single project. We have a certain amount agreed for us and the criteria that we can sort out pretty quickly with the grant administrators, the Lottery and DTI, means we can move pretty quickly and we can offer it to clients upfront. Instead of having to wait and claim back afterwards we will do that as part of the package. We can say, "This price includes a Bioenergy Capital Grant." They have good staff, they are very flexible, and they have recognised a big gap in the market for funding support for district heating. They have been flexible enough to accept district heating infrastructure to go in, which is beyond their original brief but they have been pragmatic enough to realise that the big potential growth in that area is district heating and if nobody is supporting the grant funding on the pipework it is not going to happen. Those are the pros. The cons are that there is 22% of allowable costs. You cannot include the cost of the boiler house and a number of other costs are not included in here so you are probably ending up with 17 or 18% of total project costs, which is too low to make a fundamental difference on certain projects, which means then in certain areas you have to go and get two or three other grants. In Yorkshire you go to Yorkshire Forward and say, "Can we have a grant from there?" That takes another six months. Then you maybe want a third one. So instead of it being a rapid turnover, you have to waste another nine months to assemble the grants to get to the 40% figure. If you had a very simple 40% quick rapid turnaround you could replicate and really move the market much more quickly. That is the real area of concern. It is just not big enough and the criteria of what is included in this is too restrictive at the moment. I think experience overseas where there have been grant schemes is if it is simple, quick, rapid, clear and at the right level then it works, and I think if we could get some changes those would be the areas.

Q69 Lynne Jones: The point about local authorities is important because in Birmingham where I come from they have got tower blocks and blocks of low-rise flats, in fact, some of them where they have taken out previous district heating schemes. Are they eligible for any of this money?
Mr Boyle: Firstly, retro-fitting district heating back into systems taken out is very, very expensive, which is why it is always a pity when it comes out. It is much easier with the pipework in there to upgrade it, to bring in a wood boiler; that is cost-effective. To retro-fit the infrastructure, to dig up the concrete and all the rest makes it extremely expensive. It is not impossible but you need very substantial support. You are making a long-term, 100-year social investment. In new build it is completely different. If you are digging the ground anyway to put the pipework in at the start, then the marginal costs are relatively low and it really makes sense. My sense at the moment is that again with the planning, to really influence all new build and larger, denser settlements we should look at district heating with biomass. You should really turn it on its head and you should have a good reason for not doing it rather than having to buy into it. In that way you get many more schemes much more cost effectively. You can retro-fit but the numbers are a little bit frightening at times

Q70 Chairman: Mr Calvert, I would like to ask you a question because we have heard about the potential from our other three respondents for the use of biomass both as a heat source and a potential power source. You have taken an interesting punt. You have decided to go ahead with your bioethanol plant. You do not know what the Chancellor's capital allowances are going to be, you do not know if the 20 pence is definitely going to carry on, but you have decided to take a punt. As far as the heat source of your system is concerned, are you considering using biomass as a way of a) making your total project more CO_2 friendly and b) capturing some of the potential cash that we have just been hearing about?
Mr Calvert: Hello, Chairman, I am here representing the part of the REA that is interested in liquid biofuels and in particular investing in large-scale, future, domestic, liquid biofuels plants. You are obviously mentioning the British Sugar investment at Wissington which, for the record, is a 70-million litre (that is 55,000 tonne) per year ethanol plant using sugar syrups as a feedstock, so it is integrated with an existing sugar factory. We have started building it now and I would not like to say it is a punt, I am sure it is a considered investment, but it is the first so in that respect it is bold. It is the first investment in a bespoke bioethanol manufacturing facility in the UK. It is also quite small and it is for us a limited opportunity because it is so tightly integrated with an existing sugar facility. That integration would extend in all probability, and I believe it does in fact, to the way the plant is fuelled because there are some highly specific issues relating to that plant at that site in Wissington in Norfolk. It has already got a very modern combined heat and power plant. I am sure we will come on to life cycle analysis in a moment, but the clever thing to do is supply any heat that the bioethanol plant needs (which is low temperature heat) which could be effectively supplied from the waste heat from a power station, which is what CHP is. The clever thing to do with that plant is to connect it to the

existing CHP plant. That is not to say that British Sugar has not looked at and continues to look at biomass opportunities. We are always alive to that and are active in that area in fact.

Mr Stowell: Could I just answer your question specifically does it help the CO_2 to use biomass as a fuel source; yes, very much so. It is not particularly relevant to this country but we are developing bioethanol distilleries in the Far East, using sugar cane as a feedstock and using the biomass from that to produce the heat and power and selling surplus electricity into the grid. That way our CO_2 balance is orders of magnitude better than grain distilleries that use fossil fuels.

Q71 Chairman: What I am getting from you, Mr Stowell, with your observations about overseas investment, is greater investor certainty as opposed to the domestic situation where there is vast uncertainty. I was intrigued from the British Sugar point of view that we have had you before us on a number of occasions where you have talked about what you would like to do, but you have said that there is so much uncertainty that you were not actually going to invest in this plant. Then all of a sudden you decided to put in for a planning application and now you have gone and done it, against a background of uncertainty because you still do not know what the capital allowance regime is going to be, unless you have got a special line to the Chancellor, and you do not know definitely if the 20 pence per litre duty derogation is going to be sustained for whatever the investment period is for which you want to recoup the cost and make an investment return. How come for a company like yours where investor certainty is rather important you have decided to make an investment? What is the value of the investment in the bioethanol plant?

Mr Calvert: We are talking of the order of about £20 million.

Q72 Chairman: So you are putting £20 million of your shareholders' capital at risk against a very uncertain investor background and you have bothered to do it. Why have you done it?

Mr Calvert: As I said, the Wissington investment is a special case. It has got some advantages because of its integration with the sugar factory. We have referred to it as a niche opportunity and it does not in any way point to there being loads and loads of other future investments. When we talk about uncertainties, as previous speakers did from the National Farmers' Union, in the regulatory regime surrounding biofuels investments, I can assure you that that uncertainty is still there and we are very involved with the development of the Renewable Transport Fuel Obligation because that is the key and the fact that the RTFO will work will deliver a future large-scale industry that we are really interested in and, in that respect, the Wissington investment is not a pointer of the way forward. All subsequent bioethanol plants in the UK will be contingent upon the RTFO actually working. By working it is a simple test; it has to generate a market, ie get the customers to interact with our sales force and say, "Yes, we recognise the Government's intent or the regulatory intent is that they want us to include 5% in our products, we will buy it from you at the market rate," and we stand ready to make large quantities and large investments at the market rate but we are very worried.

Q73 Chairman: Just to clarify a point finally for me on this. Again, when you first started out, I was pretty clear that this was going to be a sugar beet-related enterprise. Then in an intermediate period you extolled the virtues of grain as a very efficient feedstock. Now, as I understand it, you have gone back to sugar beet. Why?

Mr Calvert: It gives me pleasure to set the record straight on this. Obviously there has been some confusion over the past few years. I have been involved with this for about the last six years and early on we did some work to share with Government as to what would be the preferable feedstocks for a large-scale bioethanol plant, and I do assure you that at the time we came to the conclusion that in the current environment wheat in the UK would be the preferred feedstock. It is not a huge difference and yields can change but, as I remember it, we felt that a wheat plant would deliver ethanol about 10% cheaper than a sugar beet plant at that time. Since then obviously we have identified the opportunity to build this small plant at Wissington and we have gone ahead with that, and that is a clear demonstration that we mean what we say and we are ready to commit to this industry. We feel, as I know Government does, that this is a tremendous opportunity, so we have made that small step and we will be first in the market for manufacturing that fuel in the UK. However, the point about a wheat-based plant still being the preferred feedstock for a large-scale investment is still true and that is what we and many other competitors and members of the REA are still considering. There is tremendous potential for wheat to ethanol plants in the UK and you should not have to swap your wheat with someone in Spain to make it, as I heard earlier. We have got an exportable surplus of about three million tonnes and that in itself could meet 5% of UK petrol demand with no agricultural changes by 2010. We stand ready to make that investment but it is dependent on the RTFO.

Chairman: Gentlemen, it has been a fascinating hour or so. We could probably have another hour, but I fear that colleagues may have to depart to do other things and you have homes to go to. Can I thank you most sincerely for a very stimulating evidence session. You have given us a great deal of food to think about. We are hoping before much time has passed to go to the United States and another group to go to China, and I think they will have gained a great deal in terms of some very useful background information from you to guide them in the type of questions they will be asking, particularly in countries where some of the things you want to see developed here are more advanced. So thank you very much indeed for your contribution.

Supplementary memorandum submitted by Renewable Energy Association (REA) (Bio 27a)

Following our oral evidence session on 1 March 2006, the Chairman requested the Association to provide further written evidence in respect of the development of the biomass co-firing regime under the Renewables Obligation. I am pleased to provide that additional memorandum.

The Association was also invited to provide any additional submission that it considered appropriate, and I have taken the opportunity to submit further evidence in respect of two important areas:

— a framework for the growth of the biomass heat sector; and

— support for biomass power generation, including advanced conversion technologies.

With respect to the former, I am concerned from comments made to subsequent witnesses that you may have been left with the impression that the Association held a view that the biomass heat market was "all too difficult" to address. This is not the case, although it is our concern that Government may adopt this position as a basis for not moving forward. In fact the Association has a strong view as to the elements of a strategy that should be adopted to exploit the potential benefits to the UK of a developed biomass heat sector, and I am pleased to expand on this in the attached evidence.

During our oral evidence session we discussed some of the challenges faced in bringing forward biomass power projects, and there was considerable discussion of the merits, or otherwise, of the Bio-Energy Capital Grants Scheme in supporting these developments. It may therefore be appropriate to expand on this subject briefly to underlines some of the observations from the oral evidence. It also provides an opportunity to address a concern that our original written evidence, in highlighting the limited progress of power projects to date under the Grant programme, may have placed undue emphasis upon the specific circumstances of some of so-called advanced conversion technologies. In practice a number of commercial challenges are faced by a range of biomass generation technologies, including these advanced technologies. This experience has highlighted the reality of developing commercial projects in a maturing market, and the need for Government programmes such as the Bio-Energy Capital Grants Scheme to allow appropriate time for developers to address these challenges in bringing into operation.

Graham Meeks
Head of Fuels and Heat
Renewable Energy Association

Additional Evidence

Context for the Introduction of Changes to the Biomass Co-firing Regulations

1. Co-firing is a unique element of the Renewables Obligation. Although there are some other exceptions, most generating stations are only eligible for ROCs if they are relatively newly built (ie built after 1990). Allowing coal fired stations, built well before this date, to participate was done specifically to encourage the establishment of biomass fuel supply chains. The government specifically wanted to encourage purpose-grown energy crops as the addition of this resource could significantly increase the total contribution that biomass could make towards the UK's electricity demand.

2. However, there is a "Catch 22" situation regarding new power plant fuelled by biomass, and energy crops in particular. Farmers won't plant crops for a power station that hasn't been built yet, and a power station can't obtain finance to build a plant if it has no established fuel source. This problem is also encountered, but to a slightly lesser degree, with other forms of biomass. Co-firing was the means of overcoming this Catch 22.

3. The original policy intent was to allow co-firing for a limited amount of time, in order to enable fuel supply chains to become established, but to phase it out completely in 2011. Caps were imposed, however, as indicated in the table below. These caps had the objective of

— ensuring that co-firing was a temporary measure;

— limiting the overall extent of co-firing, so that it did not swamp the ROC market and leave no incentive to build new renewable generating capacity, and finally; and

— encouraging co-firers to source energy crops.

Original rules	*April 2002 to March 2006*	*April 2006 to March 2011**
Cap on suppliers	25%	25%
Minimum energy crop requirement	None	75%

* From April 2011, co-firing would no longer qualify for ROCs.

4. Fairly soon after the Renewables Obligation came into force (in April 2002) it became apparent that there would not be sufficient energy crop available by 2006. Furthermore, even if planting was to commence immediately, crops such as short rotation coppice and miscanthus could not possibly be ready in time, given the length of time taken from first planting to first harvest.

5. The Government announced a review of the co-firing rules in the 2003 Energy White Paper. The statutory consultation document was issued in August 2003. It covered a number of other issues in addition to co-firing rules.

6. The changes introduced as a result of this consultation are summarised in the table below. These new rules became law on 1 April 2004.

New rules	*Up to March 2006*	*April 2006 to March 2008*	*April 2009 to March 2010*	*April 2010 to March 2011*	*April 2011 to March 2016**
Cap on suppliers	25%	10%	10%	10%	5%
Minimum energy crop requirement	None	None	25%	50%	75%

* From April 2016, co-firing would no longer qualify for ROCs.

7. In summary, the onset of the energy crop requirement was delayed from 2006 to 2009 to allow more time for energy crops to become established. And Instead of requiring 75% energy crops from the outset, the requirement increased in stages, reaching 75% by April 2011.

8. The cap on the proportion of the Obligation that suppliers could fulfil with co-fired ROCs was reduced to 10% from April 2006, and to 5% from April 2011. Previously it had remained at 25% for the duration in which co-firing was eligible under the Obligation.

9. The objective of these new cap arrangements was to:

— to match the energy crop requirement more closely with the anticipated level of energy crop availability; and

— to constrain the impact of co-firing on the Obligation as a whole, in order that ROC prices did not drop significantly thereby posing a problem for the development of other renewables.

10. The rule changes were met with a mixed response from industry; energy crop growers were happy to be given more time but were concerned that their customers' interest in energy crops might be limited due to the caps; co-firers were happy to have more time but were unhappy about the caps as it made planning more complex; and many were unhappy simply because the rules had been changed, as such changes generally undermine investors' confidence in the Obligation.

Measures to Promote the Development of Heat Supply from Biomass and Other Renewable Sources

11. The supply of heat from biomass and other renewable sources has been demonstrated through a series of recent studies to offer the potential to make a major contribution to a series of energy policy objectives. Notably:

— The Carbon Trust have estimated that biomass heating, using indigenous resources alone, could deliver carbon savings of up to 5.6 MtC per annum.

— The Biomass task Force estimated that utilisation of biomass resource in heat-only plant could deliver carbon savings of up to 3.9 MtC per annum. These savings increase to 4.1 MtC if combined heat and power plant is employed.

12. The Biomass Task Force found that implementation of the actions proposed in its report to Government should increase the renewables share of the heat market to 3% and 7% by 2010 and 2015, from a level of 1% today. This would provide a major contribution to increasing the security of UK energy supplies.

13. In this context the Government has set out policies in its Climate Change Programme that are estimated to deliver only 100,000 tonnes of carbon savings by 2010. This level of ambition falls a long way short of the potential contribution to the UK energy supply and carbon abatement targets that biomass heat could make, and which has been demonstrated by the studies described. The situation underpins the need for the Government to develop a coherent strategy to develop and grow the biomass heat sector.

14. Government should establish a strategy for the development of a renewable heat market that addresses the immediate objectives of achieving rapid and substantial growth of the sector, whilst securing investment of the private capital necessary to support this expansion. The long-term objective is to deliver greater efficiency across the supply chain whilst ensuring the commercial viability of the industry can be sustained.

15. An important contributing factor to both the short- and long- term objectives must be that the environmental, social and economic benefits of this supply option are fully and equitably rewarded. The renewable heat industry is at a small scale today and is perceived as such by the investment community. The pattern of grant support adopted by Government presents a highly unpredictable growth outlook for the industry which acts as a deterrent for any large scale injection of capital, either from established energy businesses or third party investors. Furthermore, the availability of support for larger biomass energy installations, either via the Renewables Obligation or the EU Emissions Trading Scheme (EUETS) will continue to distort the market for feedstock supply in favour of power generation. In the absence of any mechanism to redress this balance, investors will be left with the signal that Government does not value the potential contribution from biomass heat.

16. To address these concerns, and to secure the objectives described, Government must establish a renewable heat strategy reflecting the core elements set out below:

- A strategy must enable local actors, including regional and local government, to take the initiative in facilitating the development of the local infrastructure.
- Mechanisms should be introduced that provide renewable heat with enduring support at a level that reflects the carbon, energy security and wider economic benefits that it delivers. Mechanisms should be tailored to reflect the specific circumstances of the sectors or markets in which they are applied. Such mechanisms will provide the enduring value in the industry that is necessary to attract early-stage investment.
- Positive support via the planning framework, building regulations and public procurement policies should be reinforced. A planning policy requiring a minimum 10% of energy supply from renewable sources should present a commercial opportunity to establish renewable heat as a simple, cost-competitive option.
- Capital grants should be maintained in the short- to medium- term as a basis for kick-starting the growth of an installed base of renewable heating plant. Any grant scheme should be structured to incentivise early movers and thus present an immediate impetus for the industry to reach critical mass.
- These measures should be complementary, introduced in a coordinated manner, and should together comprise a coherent strategy for the growth of the renewable heat sector, that is shared by Government and the wider industry.

17. Renewable heat supply can be delivered primarily through a range of established, proven technologies. Renewable heat therefore offers the advantage that, with the appropriate level of investment, it could rapidly rise to meet its potential and so contribute to Government objectives. Paragraph 41 of the REA's evidence highlighted facets of the direction of the existing Bio-Energy Capital Grant scheme. This reflects a concern that Government has recognised neither the potential scale nor the immediacy of the opportunity presented by biomass heat, and as a consequence has not sought to reinforce these growth prospects with adequate levels of grant funding.

18. It should be noted, however, that the mechanism for delivery of grants, via a pre-approved grant package available to a series of installations, has proved to be effective. This approach minimises the transaction costs associated with accessing and utilising these grants, and has generally proved popular with installers.

Development of Biomass Power Generation under the Biomass Capital Grant Scheme

19. The implementation of the Bio-Energy Capital Grant scheme highlights the problems presented when a single policy mechanism seeks to address a range of policy options. In this specific instance the scheme has sought to encourage deployment of established technologies such as biomass heat, encourage the development of fuel supplies, and to bring forward investment in power generation and CHP plant that faces a range of commercial challenges distinct from those faced by other renewable technologies.

20. The Association's original submission noted such considerations with specific reference to advanced combustion technologies. It is appropriate, however, to consider these within a broader context of biomass power generation:

- Combined heat and power schemes offer the potential for higher overall thermal efficiency than a power-only plant, taking greater benefit from a renewable fuel resource. However, the additional constraint of being required to secure, at appropriate commercial terms, contracts with customers for the supply of both power and heat will add considerably to both the costs and complexity of a project.
- Similarly, the adoption of advanced combustion technologies offers the prospect of higher plant efficiencies and has been positively incentivised under the scheme. However, such technologies can be regarded as "early-stage" by potential investors and lenders, thus increasing the costs of project finance and the complexity of the necessary risk management structures.
- Power projects—irrespective of the technology adopted - present a demand for biomass fuel that may be in excess of established, local resources. The sizing of a biomass power plant is highly dependent upon the cost and availability of appropriate fuel, and the contracts necessary to secure fuel supplies are fundamental to any plant's ability to secure debt finance. The interrelationship between feedstock cost and availability on one hand and plant design and financing on the other is a complex one that lies at the heart of a biomass project development.

21. Each of the conditions or circumstances described will add to the complexity, cost, and ultimately time that is required to bring forward to operation any new biomass power or CHP plant. It is the case that the timescales involved in the development of most, if not all, of the projects bought forward under the BECG scheme have exceeded the original expectations of Government and in many cases the developers. The immediate impact of these circumstances has been a lack of final realisation of the benefits of these schemes

to date, whether in respect of carbon savings, economic development or development of fuel supply. However a number of these schemes remain under development and hence the potential to deliver environmental, economic and important learning benefits remains.

22. The experience of the BECG scheme also highlights to Government that the introduction on a commercial basis of new technologies, and even existing technologies in immature markets, demands an extended timescale. Artificial deadlines that fail to reflect these constraints can add further to the risks presented to investors and even act to undermine the viability of a project.

Renewable Energy Association (REA)

April 2006

Wednesday 8 March 2006

Members present:

Mr Michael Jack, in the Chair

Mr David Drew	David Lepper
James Duddridge	Mrs Madeleine Moon
Patrick Hall	Mr Dan Rogerson
Lynne Jones	Mr Roger Williams

Memorandum submitted by Biofuels Corporation plc (Bio 21)

EXECUTIVE SUMMARY

1. During 2006, Biofuels Corporation is set to become the largest producer of biodiesel in the UK and one of the largest in Europe. We believe that biofuels have a key role to play in helping the UK meet its national and international commitments to reduce greenhouse gas emissions, particularly within the transport sector.

2. We have provided more detailed answers to the committee's questions, but believe it is helpful to draw out some key themes into this summary as follows:

— *Biodiesel, and biofuels more generally, have considerable scope for reducing greenhouse gas emissions from the transport sector.* The UK Government's own publications indicate it is expecting to fall 21% short of the UK Climate Change Programme's transport sector carbon reduction target by 2010. *At just 5% of UK fuel supply, biofuels can close almost all this carbon gap.*

— *The Renewable Transport Fuels Obligation (RTFO) design needs to provide sufficient incentives.* There is a danger, if the detailed design of the RTFO results in weak incentives, then fuel suppliers will "buy out" rather than chose to supply renewable fuels. To this end, we believe a buy-out price of *at least* 30 pence per litre is necessary.

— *Fuel duty relief should be maintained to ensure industry confidence whilst the RTFO "beds in".* In introducing the proposed RTFO, we believe it is essential that the government allows sufficient time for this important new policy to "bed in", and maintains the current incentive given by fuel duty relief whilst this happens.

— *Targets must be set beyond 2010 that drive the minimum proportion of biofuels significantly higher than 5%.* The current petrol and diesel retail standards do not allow for higher blends of biofuels and, as a result, vehicle manufacturers will not honour warranties for the use of higher biofuel blends. It is essential in our view that a clear signal is given *now* of the government's intent to go significantly beyond the 5% level to allow vehicle manufacturers and standards bodies time to make any necessary adjustments.

— *Robust, mandatory reporting of carbon performance is essential.* We also believe that for the biofuels industry to gain further credibility, it is important that full "well to wheel" reporting of the carbon lifecycle of each type of biofuel accompanies the introduction of the RTFO.

— *A vibrant UK biofuels market will result in more sustainable practices for the production of palm oil.* There are particular concerns amongst some NGOs about European demand for palm oil in the food industry and the impact this has on developing countries. The involvement of UK biofuels producers in the palm oil industry in South East Asia places us in an excellent position to influence palm production techniques and ensure much more sustainable practices are adopted for palm oil production.

— *Equitable sustainability standards need to be developed.* We believe that a robust sustainability standard should be introduced that takes proper account of biodiversity and land use displacement concerns for feedstock production, and incorporates the Criteria and Principles set out by the Round Table on Sustainable Palm. Applying the same, high standards to *both* indigenous *and* international feedstock production avoids over-simplistic, and indeed incorrect assumptions that indigenous production is always better than the use of imports. To apply such an assumption would create artificial protectionist trade barriers, raise biofuel costs artificially high, depress the uptake of biofuels and may well be incompatible with international trade law.

Introduction

3. Biofuels Corporation is an AIM listed company with a market capitalisation of around £80 million.

4. We are in the process of building one of the largest biodiesel processing plants in Europe at Seal Sands, Middlesbrough on the north east coast of England. When fully commissioned, this plant will produce 250,000 million tonnes of biodiesel per year, equivalent to some 284 million litres suitable for pure or blended use as a road transport fuel.

5. Biodiesel is produced from a variety of vegetable oils, including but not limited to palm, rape, canola, soy, linseed, coconut, mustard and cotton oils. It can also be manufactured from tallow oil and yellow grease (used cooking oils).

6. It offers similar power and energy content to Ultra Low Sulphur Diesel (ULSD), and has emerged as a realistic and desirable alternative, or blended addition, to mineral diesel.

7. Biodiesel is becoming an increasingly valuable contributor to the worlds drive to reduce greenhouse gas emissions. It has been in general pure use for the last 10 years in continental Europe. In the UK, the majority of biodiesel used is as a 5% blend with mineral diesel.

8. Advantages of biodiesel include the following:

- virtually zero sulphur content;
- zero aromatic content (toluene and benzene);
- comparable energy and power content;
- flash point of 300°F against 137°F for mineral diesel;
- significant reduction in particulates (soot) and hydrocarbons;
- 70% reduction of carbon monoxide emissions in diesel exhausts;
- non toxic and biodegradable;
- fully degraded from a waterway environment within approximately 28 days;
- significant lubricant characteristics enabling a reduction in wear; and
- extended efficiency for injectors and for all engines using ULSD resulting in lower maintenance costs.

Answers to Detailed Questions

Q1. *What is the real scope for biomass and biofuels to contribute to tackling climate change? What proportion of the UK's energy and transport fuel needs could they provide?*

9. There is considerable evidence, both from Government and independent sources, that biofuels can make a substantial contribution to tackling climate change, particularly when compared to other available measures within the transport sector.

10. The calculations used in the DFT's April 2004 consultation[1] used a range of 40%–57% carbon savings for biodiesel (compared to equivalent fossil fuel-based solutions). Other studies exist that put the range wider than this—for example, the Low Carbon Vehicles Partnership[2] has identified an even wider range of 7%–77%. The actual carbon saving for each type of biofuel is heavily dependent on aspects of their "carbon lifecycle", particularly choice of crop fertiliser, energy used in transport, refinement and other processing, and the use of production by-products.

11. In its December 2004 consultation[3] on the review of the Climate Change Programme, the UK government forecast that the "new" transport sector policy measures would yield only 4.42MtC of CO_2 reductions compared to the 5.6MtC expected when the Climate Change Programme was first published in 2000[4]. This is a shortfall of 1.2MtC, or 21%.

12. The Department for Transport have identified that "if biofuels contributed 5% of the road transport fuel used today, the UK would be saving as much as 1 MtC per annum". This would close most of the gap currently anticipated in meeting the transport sector's Climate Change Programme contribution.

[1] Department for Transport, Towards a UK Strategy for Biofuels—Public Consultation available at: http://www.dft.gov.uk/stellent/groups/dft_roads/documents/page/dft_roads_028393-04.hcsp#P91_11657

[2] Low Carbon Vehicles Partnership, *Biofuels for Road Transport,* 2005—available at: http://www.lowcvp.org.uk/resources/reportsstudies/

[3] Consultation document on the review of the UK Climate Change Programme—available at: http://www.defra.gov.uk/corporate/consult/ukccp-review/index.htm

[4] Consultation document on the review of the UK Climate Change Programme—available at: http://www.defra.gov.uk/corporate/consult/ukccp-review/ccpreview-three.pdf

13. The UK government, in its announcement of the Renewable Transport Fuels Obligation (RTFO)[5] has identified 5% *by volume* as the UK's target for the proportion of total road fuels supply that should be met by biofuels in 2010. This falls short of the EU Biofuels Directive[6] indicative target for 2010 of 5.75% *by energy content*.

14. Beyond 2010, we believe there is significant scope for biofuels to provide an increasing proportion of UK road transport fuel supply. There are three main considerations in ensuring this happens:

(a) *Current fuel standards*—5% by volume is currently the maximum proportion of biofuels possible to comply with existing fuel quality standards for retail fuel sales—EN 228 for petrol and EN 590 for diesel.

(b) *The knock-on effect this has for vehicle warranties*—In turn, these standards drive the level at which manufacturers of existing UK vehicles will honour engine warranties. Some vehicle manufacturers offer warranties as long as seven years. Consequently, in 2010, a blend beyond 5% could compromise the warranties of vehicles being sold today. However, were a more ambitious target of 10% to be introduced for 2015, vehicle manufacturers would have time to ensure they have dealt with any implications in the first vehicles produced (in 2008) that would still be under warranty by this time. Moreover, there would not appear to be any particular reasons why moving beyond 5% by volume should present vehicle manufacturers with any significant challenge—this has already happened in several Western European Countries and in South America, where blends are as high as 100%. In Germany, for example, there are already over 300,000 vehicles capable of running on 100% biodiesel, and in Brazil, sales of flex-fuel cars (that can run on biofuels, mineral fuels, or a combination of both) formed a quarter of all sales in 2004[7].

(c) *The need for a clear and ambitious long-term government policy for biofuels*—that sets out the government's long term vision for the future role biofuels will have to play in meeting transport sector demand. The hoped for introduction in Budget 2006 of such a long term framework, including targets for both 2010 and beyond, and clear indications that fuel duty relief will continue whilst the RTFO "beds in" would reduce risk substantially for investors providing capital to increase the industry's capacity.

15. The actual take-up of Biofuels over the next few years will depend to a large extent on the precise details of the proposed Renewable Transport Fuels Obligation, and the juxtaposition of this with the continuation of fuel duty relief. It is clear that the current 20 pence per litre fuel duty relief is not, on its own, sufficient to create incentives for large-scale uptake of biofuels. Given this, it is important that the RTFO creates genuine additional incentives for the uptake of biofuels. Technical details such as the precise level of the buy-out price, the firmness of the obligation, the treatment of buy-out recycling and the continuation of fuel duty relief (which we believe is essential at least until the 5% level is reached) will have a profound bearing on actual levels of take up.

Q2. *How cost-effective are biomass and biofuels in comparison with other sources of renewable energy?*

16. The Department for Transport makes clear[8] that "As a measure primarily intended to reduce carbon emissions, biofuels need to be considered within the context of the UK's Climate Change Programme (CCP) . . .", and goes on to suggest that, within the transport sector, ". . . biofuels offer one of the most cost effective options to offer significant carbon emissions reductions".

17. Within the transport fuels sector it is clear from current work that insufficient evidence is available to quantify the exact delivery economics of biodiesel, particularly in terms of its cost-effectiveness as a means of reducing carbon emissions. Cost-effectiveness of biodiesel is entirely dependent upon the market for substitute products, and high oil and power prices are making biomass and biofuels an increasingly cost-effective option.

18. The improvement and development of the rural economy by increasing the markets for feedstock crops, as well as the creation of new jobs in the processing of fuels must be included in any consideration of the cost-effectiveness of biofuels. However, these are, again, figures that are difficult to quantify with any degree of accuracy. Fluctuations in feedstock prices are additional complicating factors in quantifying the cost-effectiveness of biofuels.

19. It is important to remember that, in establishing a vibrant biofuels industry across the next few years, biofuels can be used in existing, unmodified car engines at a low blend level, so no cost is incurred in vehicle modification.

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[5] Department for Transport Renewable Transport Fuel Obligation (RTFO) available at: http://www.dft.gov.uk/stellent/groups/dft_roads/documents/divisionhomepage/610328.hcsp

[6] EU Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport—available at: http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_123/l_12320030517en00420046.pdf

[7] Canadian Automotive Network figure from: http://www.auto123.com/en/info/news/greenwheels,view.spy?artid = 54894

[8] Department for Transport Renewable Transport Fuel Obligation (RTFO) feasibility report available at: http://www.dft.gov.uk/stellent/groups/dft_roads/documents/page/dft_roads_610329-03.hcsp#P37_6185.

20. Department for Transport analysis[9] demonstrates that the carbon abatement of biofuels can be as low as £138 /tC and reach as much as £900/tC for higher value agricultural crops. HM Treasury[10] estimates the cost of biodiesel and bioethanol to be £509 and £557/tC respectively. The Low Carbon Vehicle Partnership (LCVP) estimates[11] the range of costs to be between £450 to £1,500 /tC, depending upon the type of fuel and production process.

21. Work in this area often presents biofuels unfavourably in comparison to other non-transport sector measures to reduce carbon emissions—for example, on and offshore wind, waste and landfill gas and energy crops for electricity, are estimated to cost between £240 and £480/tC.

22. However, despite some apparently unfavourable carbon comparisons, it does appear to be accepted that if progress is to be made on reducing emissons *from the transport sector*, then *biofuels should be judged against other carbon saving options for transport*, which are generally more costly than savings elsewhere. Assessing the performance of Biofuels against other transport sector measures in this way also makes sense in the context of the UK Climate Change Programme, because of its differentiation of the transport sector, as discussed in the answer to the previous question. These points were also made by a number of respondents to the Biofuels Strategy consultation[12].

23. Moreover, it is also worth bearing in mind that the biofuels industry is still in its infancy in the UK, and many of the comparisons are made against the industry's costs as they exist today. If the industry were able to scale up significantly, there is likely to be scope for cost reductions from scale economy and innovation. By contrast, mineral fuels is a scale industry with high volumes and low margins. Unless biofuels are given an incentive to generate scale economies, they will not be able to compete on cost.

24. Within the transport sector, the only viable long term alternative low carbon option under any serious development is hydrogen fuel cell vehicles. Hydrogen fuel cell vehicles are currently expensive and although cost may be reduced by mass production, it is unlikely that they will become a viable alternative in the immediate future[13].

25. In summary, it is clear that, *within the transport sector, biofuels are the only cost-effective supply-side option for reducing carbon emissions.*

Q3. *How do biofuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?*

26. Any assessment of transport biofuels should be undertaken in the context that UK Government targets for carbon emissions are not going to be met under current conditions, with the transport sector performing particularly badly. All efforts should be made as a matter of urgency to reduce carbon emissions from the transport sector.

27. Whilst not completely carbon neutral, biofuels do offer significant carbon savings compared to mineral fuels. The calculation of carbon savings from biofuels is a complicated task. A considerable number of lifecycle considerations need to be taken into account—particularly the impact of processing, what happens to by-products, the environmental impact of fertilisers, and the use and choice of fuel in related agricultural and transport activities. The 2004 DFT assessment[14] highlights a number of uncertainties and methodological issues in undertaking any form of life-cycle analysis for energy crops. It concludes that carbon savings available from biofuels are in the range 40%–60%, and could be higher with sensitive agricultural practices.

28. The first comparison of biofuels with conventional mineral oil fuels was carried out by the Low Carbon Vehicle Partnership[15] and, although not biodiesel focused, gives a detailed assessment of the full footprint of wheat to produce bioethanol. A further LCVP paper[16] concluded that the range of carbon savings available from biofuels was between 7% and 77%.

29. A further report[17] "GM Well-to-Wheel analysis of Energy Use and Greenhouse Gas Emissions of Advanced Fuel/Vehicle Systems—A European Study" states "biofuels offer reduced greenhouse gases" in comparison with conventional fuels. Greenhouse gas emissions (g/km) were up to 85% lower for biomass

[9] Department for Transport UK Report to the commission on Biofuels 2005 available at: http://www.dft.gov.uk/stellent/groups/dft_roads/documents/page/dft_roads_038897-01.hcsp#P47_5668

[10] Letter from Treasury Minister John Healey to EFRA Select Committee 2003 enquiry into biofuels.

[11] Low Carbon Vehicles Partnership, *Biofuels for Road Transport,* 2005—available at: http://www.lowcvp.org.uk/resources/reportsstudies/

[12] Department for Transport Biofuels Consultation: Summary of Responses available at: http://www.dft.gov.uk/stellent/groups/dft_roads/documents/page/dft_roads_033085.hcsp

[13] Liquid biofuels and renewable hydrogen to 2050, Department for Transport, 2004, available at: http//www.dti.gov.uk/energy/sepn/h2bioassessment.pdf

[14] Liquid biofuels and renewable hydrogen to 2050, Department for Transport, 2004, available at: http//www.dti.gov.uk/energy/sepn/h2bioassessment.pdf

[15] LCVP 2004: Well-to-Wheel Evaluation for production of ethanol from wheat available at: http://www.lowcvp.org.uk/uploaded/documents/Biofuels_WTW_final_report.pdf

[16] LCVP 2004: Well-to-Wheel Evaluation for production of ethanol from Wheat available at: http://www.lowcvp.org.uk/uploaded/documents/Biofuels—WTW—final—report.pdf

[17] "GM Well-to-Wheel analysis of Energy Use and Greenhouse Gas Emissions of Advanced Fuel/Vehicle Systems—A European Study" available at: http://www.lbst.de/gm-wtw/TheReport_Euro-WTW_27092002.pdf

fuels than mineral oil-derived fuels. The report stressed that energy consumption and greenhouse gas emissions must be assessed on a full well-to-wheel basis when considering any meaningful examination of the carbon savings available from use of biofuels and notes that the biomass pathways depending on situations differ widely in terms of potential GHG emissions. Discussion of biomass processing by gasification or enzymatic hydrolysis also highlights that these processes give even lower greenhouse gas emissions than conventional biofuels.

30. The US Department of Energy's Alternative Fuels Data Center[18] indicates that "Neat biodiesel (100% biodiesel) reduces carbon dioxide emissions by more than 75% over petroleum diesel. Using a blend of 20% biodiesel reduces carbon dioxide emissions by 15%."

Q4. *Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?*

31. There are two aspects to this question that need to be considered—carbon savings and wider sustainability issues to do with feedstock crop production. It is also important to bear in mind that sustainability standards need to apply equally and equitably to feedstock crops produced indigenously as well as those that are imported.

Carbon accreditation

32. We believe that full life-cycle analysis should be the basis for carbon accreditation, and that compulsory reporting is appropriate under a carbon accreditation scheme as discussed by the Low Carbon Vehicles Partnership[19].

Wider sustainability concerns

33. As a company which is addressing such an important environmental need, we recognise the importance of ensuring the positive contribution we make in helping to reduce carbon emissions is not negated by involvement in, or creating incentives for, unsustainable practices in the production and processing of feedstocks throughout our supply chain.

34. This is especially important in our case given our use of palm oil as a significant feedstock, and concerns highlighted recently by Friends of the Earth and other environmental NGOs in relation to unsustainable practices in palm oil production, driven to some extent by Western European demand for palm—today mainly in products sold by the food and cosmetics industries.

35. In particular we strongly believe that the biofuels industry should be based on sustainably produced palm production which does not create any future rainforest destruction. Continued dialogue with NGOs is vital to ensure that a robust environmental standard is drawn up. Benchmarks agreed by the industry must be high enough to ensure that there is an industry-led drive for continuous improvements in feedstock farming practice. In many Asian countries where rainforest has already been cut down for palm plantations, as Friends of the Earth acknowledge:[20]

> *"we need all of those companies that have fuelled the expansion of the palm oil trade . . . to address the social and environmental problems with the utmost urgency"*

36. We believe the involvement of companies such as Biofuels Corporation is key to introducing new sustainable standards into plantation management and the prevention of further habitat destruction. Our engagement with the palm oil industry in South East Asia places us in an excellent position to influence palm production techniques and ensure much more sustainable practices are adopted for palm oil production. To this end, we have taken a number of steps as follows:

(d) As recommended by Friends of the Earth and WWF, we have joined the Round Table on Sustainable Palm (RSPO)[21]. We are committed to the Criteria and Principles that RSPO agreed in October 2005[22], the details of which are attached to this submission. In particular, we would wish to draw attention to Criterion 7.3, "New plantings since November 2005 have not replaced primary forest or any area containing one or more High Conservation Values", and Criterion 7.7, "Use of fire in the preparation of new plantings is avoided other than in specific situations, as identified in the ASEAN guidelines or other regional best practice".

[18] http://www.eere.energy.gov/afdc/altfuel/bio_benefits.html

[19] Low Carbon Vehicles Partnership, *Biofuels for Road Transport*, 2005—available at: http://www.lowcvp.org.uk/resources/reportsstudies/

[20] Extract from conclusions (p 23) of "Greasy Palms—palm oil, the environment and big business", Friends of the Earth, available at http://www.foe.co.uk/resource/reports/greasy_palms—summary.pdf

[21] http://www.sustainable-palmoil.org/

[22] http://www.sustainable-palmoil.org/PDF/CWG/RSPO%20Principles%20&%20Criteria%20for%20Sustainable%20Palm%20Oil%20(final%20public%20realease).pdf

(e) We are members of the Low Carbon Vehicles Partnership, and are working actively with other UK industry stakeholders on an environmental standard which we believe should incorporate the RSPO principles and criteria, but will also need to address other concerns in respect of land use impacts and biodiversity, more details of which are given in our answers to questions 7 and 8.

(f) We support the development of a robust accreditation scheme in order that biofuels companies can demonstrate their compliance with the environmental standard referred to above. To this end, we have started a programme of developing bilateral arrangements with all our key feedstock suppliers to develop methods of ensuring traceability of feedstocks to ensure sustainable practices are not only adopted, but can also be transparently demonstrated. Our work in this area is presently particularly focused on palm oil production, as we recognise this to be the area requiring most urgent attention. This work on accreditation and traceability is in its early stages, is moving ahead quickly, and will develop further in parallel with the development of the content of the standards.

37. We therefore strongly support the introduction of a wider Sustainability Code where definitions/ benchmarks of sustainability are clearly set out and agreed upon across the industry in discussion with environmental NGOs and relevant Government agencies such as English Nature. We believe it is particularly important that such a Code tackles directly the concerns expressed by a number of environmental NGOs, particularly WWF and Friends of the Earth, in relation to palm oil production in developing countries. It is also important, in line with European Commission intentions[23], that the standards, whilst high, should be compatible with open trade principles.

Q5. *What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and biofuels?*

38. The biofuels market is driven currently almost exclusively by government action. The EU Biofuels Directive has been instrumental in driving UK consideration of policy in this area. Carefully conceived and executed government and EU policy will be a key determining factor in developing the future biodiesel market. The UK is relatively new to biofuels at any substantial scale[24], and the fuel duty relief of 20ppl introduced by the UK government for biodiesel in July 2002 is widely recognised to be largely responsible for the majority of biofuels sales today.

39. It is important that policy is now driven hard in this area, particularly in the light of the transport sector's shortfallling against UK Climate Change Programme targets. Policy is critical in doing so, with the principal measure, the Renewable Transport Fuel Obligation (RTFO) already announced in November 2005. In developing the RTFO, we believe it is particularly important:

(g) *To set an ambitious target beyond 2010:* As explained in our answer to question 1, the 5% by volume target is merely the status quo in respect of fuel standards and consequent vehicle warranties. An early indication of a move to 10% by 2015 is a critical catalyst to revising the fuel standards and ensuring vehicle warranties follow. Given today's relatively long vehicle warranties (up to 7 years), the first vehicles capable of running under warranty at a 10% blend would be produced in 2008.

(h) *To ensure a high enough buy-out price in the RTFO*. It is also very important that the buy-out price is set within the RTFO in a manner that results in biofuels being cost competitive at the pump. To this end, we consider a buy-out price of 30ppl is an appropriate level.

(i) *To ensure stability of fuel duty relief at 20ppl whilst the RTFO beds in.* The RTFO represents a significant unknown for the industry because, depending on the precise rules surrounding recycling, the level of incentive it provides may fluctuate significantly. Fuel duty relief, on the other hand is predictable (albeit only for a relatively short period), and therefore inspires much more industry confidence while the RTFO mechanism is becoming established. We therefore believe that, in order to ensure confidence in the industry, fuel duty relief should be retained at 20ppl, to give the industry a chance to allow the RTFO to "bed in" and establish itself as an effective additional policy mechanism.

40. In November the UK government announced an RTFO consultation would be taking place. Discussions with environmentally active NGOs, industry specialists and representatives of the car industry and agriculture industry are essential to ensure the effective and meaningful introduction of the RTFO, and the impending RTFO consultation is expected to have an extremely positive effect on the market demand for biodiesel.

41. Current legislation affecting the biofuels industry includes the EU Biofuels Directive[25] stating that by 2005, the minimum share of biofuels sold in member states should be 2% by energy content and should gradually rise to 5.75% by the year 2010. Member states do not have to meet these indicative targets,

[23] An EU Strategy for Biofuels, COM (2006) 34 final, available at: http://europa.eu.int/rapid/pressReleases Action.do?reference = IP/06/135&format = HTML&aged = 0&language = EN&guiLanguage = en

[24] http://www.dft.gov.uk/stellent/groups/dft_roads/documents/page/dft_roads_610329-03.hcsp

[25] Directive 2003/30/EC, available at http://europa.eu.int/comm/energy/res/legislation/doc/biofuels/en_final.pdf

although they must be able to justify any significant differences between their domestic targets and those set by the EU, so are held to account to some extent. Stronger European legislation that includes proper redress for failing to meet targets would be more constructive in terms of developing the biofuels market.

42. It is worth noting that the UK failed to meet the indicative target for 2005 set by the Biofuels Directive, and now needs to move fast in order to catch up.

Q6. *What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?*

43. The UK government published a consultation document[26] in December 2004 seeking views on its review of the 2000 Climate Change Programme. This consultation document contained up to date forecasts of expected emissions, and indicated that annual CO_2 emissions in 2010 were now expected to be 14% lower than 1990 levels. This falls considerably short of the expectation in the original CCP of an equivalent reduction of 20%. In the transport sector, the government's revised figures indicate the "new" policy measures identified in the CCP (listed above) would yield only 4.42 MtC of CO_2 reductions, rather than the 5.6MtC expected in the CCP, a shortfall of 21%.

44. After Russia's ratification of the Kyoto Protocol in February 2005, the UK now has a legally binding commitment to reduce a basket of greenhouse gases by 12.5% of 1990 levels by 2008–12.

45. The UK's EU commitments are outlined in the Biofuels Directive, obliging Member States to set non-binding targets for the inclusion of alternative fuels as a minimum proportion of all petrol and diesel sales. The Directive cites 2% by 2005 and 5.75% by 2010 as indicative. The confirmed target for the UK for 2005 is 0.3%[27], equivalent to 12 million litres per month. This falls significantly short of the indicative target for 2005 set in the Directive. The proposed target for 2010 must be set by 2007.

46. These shortfalls in Government targets can only realistically be compensated for by setting high targets within the transport sector for the uptake and use of biofuels. The government's current target of 5% by 2010 for the Renewable Transport Fuel Obligation will, by its own calculations, not be sufficient to make up the 1.2MtC shortfall against the UK Climate Change Programme identified above.

47. The level of policy and financial support that the industry requires is contingent upon substitute market conditions and feedstock markets, as well as capital cost recovery—these are all variable, making qualitative and quantitative details difficult to define. Any policy and financial support from the government must be under constant progressive review in consultation with industry specialists and other involved parties.

48. Once the RTFO is introduced, it will take the industry some time to gain experience with its operation, and there may well need to be some revisions to the precise details of its operation. Whilst this takes place, it is important that investor confidence is not undermined by any reductions in the current level of fuel duty relief. To this end, as covered in the answer to question 5, we believe that a buy-out price in the RTFO of 30ppl is appropriate, and that to ensure continued industry confidence whilst the RTFO beds in, we believe the government should undertake to retain fuel duty relief.

Q7. *What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?*

49. This is difficult to predict with accuracy as it is likely that feedstock will come from a variety of sources, both within and outwith the EU. It is essential that legislation and/or standards that cover the production of energy crops for biofuels apply internationally to ensure that an ethical code of best practice is followed worldwide. The impact of increased energy crop production depends upon the efficacy of incentives and competing pressures for land use. It is important that sustainability implications of producing biofuels are equitable for both indigenous and imported crops.

50. At a basic level of analysis, it is inevitable that any increase in energy crops will have some impact on land use which in turn could lead to significant changes in biodiversity, water resources and rural landscapes. However, a robust sustainability standard, such as that under development in the Low Carbon Vehicle Partnership will monitor these impacts as much for indigenously produced crops as for imported ones.

51. Furthermore, there are issues about just *how much* land will be needed for biofuels if they are to be grown domestically. According to the East of England Development Agency[28], a 5.75% target for transport biofuels would require over 0.5 million hectares of arable land for harvesting feedstock. This is one-ninth of available arable land, according to an interview conducted on our behalf with the Campaign to Protect Rural England. An E4Tech study (Hart *et al*, Dec. 2003, "Liquid biofuels and hydrogen from renewable resources in the UK to 2050, Technical Analysis") that concluded that 5% by volume of biodiesel from oil seed rape would require 1.05 million hectares, 5% bioethanol from wheat, 0.8 million hectares and from sugar beet, 0.38 million hectares. English Nature cite a study (by Turley, D.B. *et al* (2002), "Liquid

[26] http://www.defra.gov.uk/corporate/consult/ukccp-review/index.htm
[27] http://www.dft.gov.uk/stellent/groups/dft_roads/documents/page/dft_roads_038897-01.hcsp#P47_5668
[28] East of England Development Agency, "*The Impacts of Creating a Domestic UK Bioethanol Industry*".

biofuels—prospects and potential impacts on UK agriculture, the farmed environment, landscape and rural economy") which concludes that it will be a challenge to meet the EU biofuels target for 2010 using UK-produced feedstocks alone.

52. The instigation of accredited carbon reporting schemes, as previously discussed, and wider sustainability control measures within an accredited scheme should ensure adherence to common standards, which should be ethically exemplary and should reflect the industry's continuing commitment to the environment. Open, international markets should all conform to these cross-industry standards.

53. Careful resource planning could mitigate any decrease in biodiversity resulting from the monoculture of energy crops for a growing biofuels market. For example, France has added energy crops to its regular food-producing crops, increasing biodiversity[29]. "*France is currently using 70% of its non-food set-aside land (410,000 hectares) for biofuel production. This has helped France to produce 300,000 tonnes of biodiesel and 100,000 tonnes of bioethanol in 2001, making France the largest biofuel producer in the EU."*

Q8. *Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?*

54. It is important to ensure focus is kept on the primary policy objective of the use of biofuels—reductions in vehicle carbon dioxide emissions. Whilst it is important that both the carbon efficacy of different types of biofuels is properly considered, and that wider sustainability concerns are addressed, it is over-simplistic, and indeed incorrect, to apply a general rule that indigenous production is always better than the use of imports. To do so would create artificial protectionist trade barriers, stop cost effective solutions emerging and may well be questionable under international trade law in any event. The European Commission has recently reinforced this with its intention to enhance trade opportunities for biofuels and the biofuels supply chain[30].

55. We firmly believe that pre-determined standards should be set, and that the market should be free to decide the most cost effective means of meeting those standards through a combination of indigenous production and imports. To this end, we consider the work taking place in the Low Carbon Vehicle Partnership on both carbon accreditation and wider sustainability issues to be of key importance.

Q9. *What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (e.g. wood waste and other organic waste)?*

56. We would expect, as technology develops, to use an increasing proportion of biomass by-products for process heat production.

Q10. *What lessons can be learned from other countries' experience in the production and use of bioenergy?*

57. *Across Europe*, according to the UK Environment Agency[31] *"Fuels such as bioethanol are in use in a number of countries including Brazil and the USA. In Europe, hundreds of thousands of vehicles already run on 100% biodiesel"*

58. *In France*[32], *"Biofuels (including biodiesel and bioethanol) currently represent 1% of total fuel consumption in France per year. According to the French biofuels industry, biofuels are the only liquid renewable fuels immediately available, which production can be used to fulfil France's commitments under the 1997 Kyoto protocol. The French Ministry of Agriculture considers that biofuel production is important for France because these new markets for farmers increase farm income, has a positive impact on land management, creates jobs, and reduces EU deficit in protein meals for animal feed. The reformed Common Agricultural Policy adopted in June 2003 sets a carbon credit payment of 45 Euros per hectare for farmers for growing non-food crops. Biofuels are not price-competitive with fossil fuels, and biofuel production has developed in France since 1993 because the French Government has implemented significant tax reductions on these products".*

59. *In Germany,*[33] *"production capacity has increased fivefold from 110,000 MT to 533,000 MT over the period of 1995 to 2001. By the end of 2002, capacity is forecast to reach close to 1 million MT. The German Government supports the use of biodiesel by offering a 100 percent mineral oil tax break. As a result manufacturers prefer to produce pure RME over RME/fossil fuel blends. For the consumer, RME is currently about three to 10 Euro cents per litre cheaper than fossil diesel. In Germany fuels are subject to the following taxes: mineral fuel tax (Mineralölsteuer), ecological tax (Ökosteuer), and a value added tax (Mehrwertsteuer, MwSt.). For diesel fuel, the mineral oil tax and ecological tax together amount to 43.97 Euro*

[29] http://www.esru.strath.ac.uk/EandE/Web_sites/02-03/biofuels/foreign_europe.htm

[30] An EU Strategy for Biofuels, COM (2006) 34 final, available at: http://europa.eu.int/rapid/pressReleases Action.do?reference = IP/06/135&format = HTML&aged = 0&language = EN&guiLanguage = en

[31] http://www.environment-agency.gov.uk/aboutus/512398/289428/1159575/?version = 1&lang = _e

[32] USDA Foreign Agricultural Service Global Agricultural Information Network of 8/29/2003. France: Agricultural Situation: French Biofuel Situation 2003.

[33] USDA Foreign Agricultural Service Global Agriculture Information Network Report of 24 October 2002.

cents per litre in CY 2002 and to 47.04 Euro cents per litre from CY 2003 and onwards. Both taxes are charged to the fuel producer and handed down to the consumer through a more expensive price. In addition a value added tax of 16% is also charged at the consumer level. Pure biodiesel is traditionally exempt from the mineral oil tax (not from the value added tax) in order to support the use of environment-friendly energy. In June 2002 the German government passed a law to prolong the tax relief until 31 December 2008 and to extend it to all other biofuels, such as bioethanol, as well as to blends. In the case of blends, only the biofuel portion is exempt from tax action. For example: a blend that contains 20% biofuel receives a tax reduction of 20%. The law will become effective in January 2003, provided the EU grants approval according to the directive 92/81/EWG".

60. *In Austria,*[34] *"the production and use of biodiesel in Austria biodiesel is subject to remarkable tax reductions. If biodiesel is used in a pure form the exemption from the tax on oil is 100%. If the content of biogenous fuels is up to 5% the tax for the entire biogenous share is refunded. The production of biodiesel in small scale plants from agricultural co-operatives is totally free of mineral oil tax as long as the fuel is exclusively used in farms. Further tax relief exists for bioethanol blends".*

Biofuels Corporation plc

February 2006

Memorandum submitted by The Energy Crops Company Ltd (Bio 06)

Please find below a brief series of responses to the questions raised in the recent terms of reference.

Our responses are brief of necessity as we are an early stage company whose efforts are focused upon commercialisation of proven technologies in wood heating, which we believe can both make a significant contribution to climate change targets, and contribute to wider integrated renewables policy. The number of enquiries into our industry sector is unhelpful on two fronts:

(i) They are very time consuming.

(ii) They are often divergent in suggesting that one technology is preferable to another without suggesting an overall plan or balance.

We believe that the rapid implementation of current Best Available Technology (BAT) alongside clear and consistent strategic goals is the best way to allow industry to develop an efficient network of renewables. Industry will inevitably find many ways to optimise and integrate these technologies creating significant improvements in overall efficiency.

These efficiencies will only be unlocked by operational industries, not by agonising over one technology at the expense of another, or by comparing wildly optimistic theories about future technology with outdated criticisms of those available today.

Q1. *What is the real scope for biomass and biofuels to contribute to tackling climate change? What proportion of the UK's energy and transport fuel needs could they provide?*

Previous Government figures have suggested that each can contribute up to 30% of the transport or heat sector respectively.

Resource figures are usually taken in isolation, and do not take account of synergies which will emerge from an integrated system. Much of the work of the National Non Food Crop Centre (NNFCC) can only be commercialised if a full scale biofuels industry provides coproducts for biorefining, in the same way that petrochemicals derive from fossil fuel production.

Q2. *How cost-effective are biomass and biofuels in comparison with other sources of renewable energy?*

Currently not as cost effective as they can be. Once the industry optimises the use of all of its output, through a range of linked technologies, the economics will compare favourably with both fossil fuels and other renewables. Support for these industries will be required in the short term, but should be judged against the longer term outputs achievable, not the short term output of each in isolation.

Q3. *How do biofuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?*

Biofuels are currently capable of carbon savings of over 70% compared to fossil fuels. They represent the only realistic option for renewable transport fuels in the short term, and are consistent with most envisaged technologies.

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[34] http://www.erec-renewables.org/documents/RES—in_EUandCC/Policy_reviews/EU—15/Austria_Policy_Review_final.pdf

Q4. *Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?*

Simple accreditation schemes should be based upon existing schemes and data, for the links in the supply chain. Resulting standards should be applied equally to imports and domestic production.

Q5. *What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and biofuels?*

None unless they are consistent. Government must resist the temptation to micro manage the implementation of renewables technology. Clear targets, simple fiscal and investment regimes, and reasonable (five year) time frames are basic tenets of industry, but alien to Government.

Q6. *What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?*

Biofuels and biomass heat have clear cost disadvantages to their fossil competition. Setting support mechanisms which clearly exceed this cost differential for a reasonable period will achieve a number of objectives:

- Give a kick start to two sectors where renewables are trailing other European countries.
- Give the industries time to become more efficient, individually and collectively before reducing support.
- Avoid under compliance as imported material becomes too expensive or is drawn away by more favourable regimes.
- Reinforce to consumers that no energy source is cheap in periods of market shortage. The rational players invest in long term sustainable supply.

The correct support mechanisms are a combination of duty concession and obligation for biofuels, and capital infrastructure grants for biomass.

Q7. *What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?*

If correctly managed, it could contribute to improved biodiversity, and avoid negative impacts on food or the environment.

Q8. *Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?*

What else would we do with it? We have historically enjoyed one of the most efficient farming communities in the world. CAP reform raises the possibility of significant areas exiting productive use when it could be put to productive use in the creation of renewable energy, to economic, environmental, social and fuel security benefit.

Q9. *What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?*

There should be little if any waste from a correctly integrated system. Co products from one process should form the raw material for another. Integrated transport, and local networks will also minimise transport waste, and use any spare process energy for other processes.

Q10. *What lessons can be learned from other countries' experience in the production and use of bioenergy?*

Strong early support and consistency will stimulate a base to build upon. Few if any have unlocked the benefits of integrating current technologies with agricultural outputs to achieve long term goals, the UK can still lead the way.

The Energy Crops Company Ltd

February 2006

Witnesses: **Mr Sean Sutcliffe,** Chief Executive, Biofuels Corporation plc, and **Mr Graham Hilton**, Managing Director, the Energy Crops Company Ltd, gave evidence.

Q74 Chairman: Ladies and gentlemen, may I welcome you to the second evidence session of biofuels. For the record, welcome Mr Sean Sutcliffe, the Chief Executive of Biofuels Corporation plc, and, from the Energy Crops Company, Mr Graham Hilton. I do appreciate that you come at this problem from slightly different backgrounds, but, if there is a question that I or a member directs to one and the other feels compelled to want to make a contribution, if you would just catch my eye, we would be delighted to have your respective views on the subject. I would like to start off by asking each one of you the same question that I asked to our witnesses last week. What do you think is good about Government biofuels policy and what do you think is essentially bad?

Mr Hilton: I would like to start, if I may, by explaining where I fit into the equation. I am more than happy to answer questions on biofuels because for my sins I am the Chairman of the Environmental Industries Commission Road Transport Fuels Group, which looked at biofuels and was heavily involved with Lord Carter in drafting one of the first mechanisms for the Renewable Transport Fuels Obligation. My submissions to this Committee, however, were on a slightly different level, in that, as the Managing Director of the Energy Crops Company, my objective is to commercialise wood heating. If my views seem a little disparate, then that is the reason why. In terms of an approach to biofuels and bioenergy in general, I think the most encouraging thing is that it exists and that it has the attention of Government across such a wide span. That does, however, carry with it the single biggest disadvantage to which I alluded in my written submission, that I do not think we are alone, as a relatively small company, the Energy Crops Company—I know it is a problem with some of the bigger companies—in understanding what is the most effective way to feed our views into Government. As far as biofuels are concerned, we were told some time ago that there were five Government departments involved in looking at this, and that it was so important that there would not be a lead department, all five would lead. I am not sure if it occurred to anybody at that time how unhelpful it was if those five led in different directions, and that certainly seems regularly to have been the case. You are also probably conscious, as we are, that there is the Energy Review being undertaken by the DTI, the Stern Review on the Economics of Climate Change, and the number of investigations is not only almost endless but also regularly very contradictory. That is our biggest single problem as an industry, in making our views not just heard but coherent.

Q75 Chairman: Just before I bring Mr Sutcliffe in, I wonder if you could tease out some of the differences in approach that you have come across. The Committee would be interested to hear about those.

Mr Hilton: It is very difficult at times to understand what some of the individual departments are trying to achieve. At the early stages of legislation, one has often encountered that Defra will have an attitude on transport, DfT will have an attitude on agriculture, and Treasury may have an attitude on carbon assurance. It seems to be the rule rather than the exception for Government departments to seem to have views on things which are not within the apparent orbit of their departmental responsibilities. However, as much as anything, it is literally a question that we have some very coherent views on biofuels—I think it is fair to say that the two major trade associations have virtually identical views—but we are asked on a very regular basis exactly the same questions by several different departments and the responses that then come back as a result of that input often seem to bear no relation to the input that we have given.

Q76 Chairman: Right, Mr Sutcliffe.

Mr Sutcliffe: Thank you. From a slightly different perspective, Biofuels is building in the UK one of Europe's largest biodiesel plants up in Teeside. We have produced our first biodiesel, and it will be equivalent to about 1% of UK biodiesel requirements. In a sense, it is a measure of where the UK has not so far got—in that the level of biofuels production in the UK is so far behind our European competitors—so there has been a lot of, if you like, policy direction and yet, funnily enough, not much investment in the UK against that policy objective. In terms of what is good about the change in policy that we have seen over the last year or so, I think a policy that is clearly grounded in the prime objective, which is carbon—which is carbon in the transport sector, where we have such a poor track record alongside other countries, I need to say—is important, because that sets for our business a very long, clear objective against which we can invest. The second thing that is good about the policy direction we are seeing at the moment, is that it is a switch from duty differentials, which have the benefit at least of certainty and clarity but they do not have the longevity that long-term investments that we are looking to put in place need. The third thing that is good about the policy direction is that it sets a clear direction for sustainability and for carbon measurement. I am sure we are going to have some questions about that. It is important to recognise that we are very much an embryonic industry and there is no point inventing a gold-plated industry without having an industry in place. I am sure we are going to come back to how we move to put in place the clear policy goals that we want. What is bad? if I may turn to the other side of your question. I suppose it is not bad, it is just deferred goodness, because we are waiting for the Chancellor to put in place what I think is necessary, which is long-term targets. We will be looking for a volume target beyond 2010, which is in our books very medium term; we will be looking for a target of 10% by 2015, which will require some changes in standards and other people to improve or at least verify their car performance to get there; and we are looking for an ambitious set of short-term incentives, which means the target out until 2010,

both in terms of the volume targets and to ensure the duty differential remains, to allow a time for bedding in of this new and what I think is a better long-term incentive mechanism.

Q77 Chairman: What intrigues me about the words you just uttered is that, as you rightly said in your evidence—you are an £80 million cap company on AIM—you have already taken the decisions to make some pretty formidable investments in this field against a background of the elements of uncertainty about longevity and objective which you have outlined to us. Why have you decided, notwithstanding all these uncertainties, to have invested? How much have you invested?
Mr Sutcliffe: I should say, for the followers of AIM stocks, that Biofuels has had an interesting genesis and quite a difficult one in terms of a rather bold investment decision by the entrepreneurs who set this up—who, by the way, are Australian—plus investors. I came in to ensure that their vision is turned into something a little bit more grounded in reality and delivery, so it has been an ambition and, I have to say, for our investors, a bold investment decision that they have made, alongside Barclays Bank, who have also put substantial capital behind the business. It has been against the background of the European incentives that the market case has been made.

Q78 Chairman: You would not have made the investment and your investors would not have put the money in unless you thought you were going to get a positive return on your money. You have gone down the palm oil route basically for feedstock, am I right?
Mr Sutcliffe: No, you are not. We are using a basket of vegetable oils, including rapeseed oil, soya and palm—and, indeed, I think we have been the largest buyer of UK rape oil in the last 12 months for biodiesel in the UK. I think it is based in the UK because—if I can sing the praises of north-eastern MPs—the way it has been approached in the UK in terms of flexible investment and infrastructure makes this a good place to invest, but the markets will be the UK and European markets, and, indeed, in the short term clearly the European market is actually a more attractive one than the UK one. In the longer term, we think that the policy measures that the UK is putting in place should make the UK a good market too, and that will be the basis for further investment that we would make.

Q79 Chairman: To be entirely clear, you are saying to the Committee that the current duty derogation of 20 pence per litre, the promise of uncertain but nonetheless specified capital allowances—which would not affect what you have already done because you have already made your investment—and the Road Transport Fuels Obligation are sufficient points of certainty for you to say it is worth investing in this industry because you opened up by pointing out that we are an awful long way behind and we are trying to establish why. I would like to know from our two witnesses whether you think the Government is truly committed and enthusiastic about this, or whether, in the nicest sense, it is just going through the motions.
Mr Sutcliffe: I do not want to monopolise this, because Graham you have been involved in this field for much longer than I have, but I suppose I would say that our analysis is that the Government has no choice. We are going to hit only half of the 20% targets; the carbon emissions in transport have gone up by 10% over 15 years, and therefore are rising as a percentage from 20 to 25%; and in terms of measures which can make a demonstrable difference in the transport sector (short of forcing everybody to cycle to work) this is one of the demonstrable measures which can make a difference, and therefore our judgment is that this policy has to happen. Whether it happens aggressively, to allow the UK to grow from virtually nothing to being one of the European leaders in biofuels, or whether it will continue to be a laggard is a matter of debate. From our perspective, we believe that Europe as a whole will move ahead and if the UK is not the right market for biofuels we will have the ability to sell to Europe.
Mr Hilton: My feeling is that the policy battle is effectively won. If there is a failure—and I think there is a very real and imminent danger of market failure in biofuels—it will be almost accidental. The difference in position, as I understand it, from what is circulating in Whitehall and the position which the industry wishes to have, revolves around what is perceived as a package of measures. It is clear that obligation is a different and complementary measure to duty derogation. The industry is asking that the obligation has from the outset an effective buyout price (that is, 30 pence per litre) which will incentivise the oil industry to engage with biofuel producers because it will be a lot cheaper to include biofuels than to buy out. The risk comes because, while Treasury appear willing to continue duty derogation for some time. We envisage that continuing at 20 pence in the 2008–09 period but then tailing off, so it would be a capped cost over two or three years. Within certain Government departments there appears to be a desire to have a capped package, which would be an addition of buy-out and duty, coming to a total of a combined 30 pence. The reason that is a fallacy is that the cost of complying is no different whether the buy-out is 30 pence a litre or £3.30 a litre. The real cost of compliance is what it costs to buy the product, so to say you are supporting a market by having a 30 pence buy-out to a degree of 30 pence support is false: you are supporting it to the amount it has to pay to comply.

Q80 Chairman: Would I be right in saying that, as far as sourcing, in terms of the major oil companies who will have the obligation to fulfil they can buy from wherever they want?
Mr Hilton: They can today. That choice will become limited. At the end of the day, the UK industry does not have to compete with petrol—that will come in time anyway—it has to compete with import. Our confidence as a potential producer—I represent an ethanol producer in the South West—is that the

availability of imports from Brazil will become constrained by a lack of overall supply, so we are confident that overall demand will come. We need a very clear signal from Government short-term that allows that UK industry to develop. The investors in our industry do not see a risk of not having a market for the product in 2011.

Q81 Chairman: You have used the term 'signal in the short term'; Mr Sutcliffe used the term 'long-term incentive'. Short and long seem to be incompatible in this context. I am struggling to understand. We have looked at this before and when we started out on our voyage of inquiry we were told by the industry that they must have 27 pence a litre duty derogation. Now I have Mr Sutcliffe, whose company has made a major investment, saying if we have 20 pence for long enough . . . . Tell me where I am wrong.
Mr Sutcliffe: It is predicated on a long-term, Renewable Transport Fuels Obligation at 30 pence, which is what the consultants to the Government have suggested.

Q82 Chairman: That is the buy-out price.
Mr Sutcliffe: That is a buy-out price, and in the short term and medium term a certainty in terms of price or better clarity in terms of price, until we see the RTFO mechanism—how it works in practice and bedded in—to give us that price certainty to make the investment in the short. So, just to clarify, I am not suggesting that a long-term transport obligation with a buy-out price of 20 pence will stimulate investment in the UK. It will not.

Q83 Chairman: How do we get to the figure of 20 pence for the derogation and 30? Have you ever seen a piece of paper which explains why 20 and 30 are deemed in these respective activities to be the right numbers?
Mr Hilton: I think 20 already exists. There is no great debate on that. That is what we have started with and persuading Treasury to extend that has been one of the challenges, which they appear to recognise. The 30 pence is quite simply, today, double the cost of buying, whether it is ethanol or biodiesel. The cost differential between ethanol and petrol is approximately 15 pence; the cost differential between biodiesel and fossil diesel is approximately 15 pence. Our understanding of the market dynamics—and I am a semi-reformed oil trader—is that, if somebody faces a 30 pence penalty for not buying something at 15 pence, they will comply. So with the first mechanism, the obligation is there to encourage engagement by the oil industry. The reason we want an overlap on duty is so that, over the intervening period, until April 2008 when the obligation comes in—and remember that in the first year it could be very heavily traded around, its impact could be very uncertain for the first year or 18 months—there would be the continuing incentive of duty. The difference between the industry position and the apparent position of Government—and I know Treasury do not like to have words put in their mouths—is this cap at 30 pence. We are asking that the 30 pence is the buy-out, the duty continues on a cap basis. If that were to happen to 2010, the total difference in cost between the two approaches is less than £1 billion—and that would get me a long way. I am sure it does not get Government that far! And to have the difference between market sense and total market failure for biofuels abandoned for £1 billion, I think, in retrospect will prove very poor value.

Q84 Chairman: At the moment we are talking, relatively speaking, to the major oil giants, of very small-scale UK production of liquid biofuels. Why is it that the market's advance into this area has been left to entrepreneurs and risk takers like you? Why has not Mr Shell or Mr BP (who seems to be spending an inordinate amount of advertising money on telling us he wants to go beyond petroleum) got into it? Or are you hoping that they will buy you?
Mr Sutcliffe: I can probably answer that question. It is not BP but BG (being responsible for corporate development there previously), and for me it would not have passed muster in terms of a strategic investment. In their context it is too small and the returns are better in exploration production than refining and market. So it simply would be too small and in the wrong sector for my capital allocation process. That is the decision I would have made, coming from an oil major. From our point of view, it is an opportunity, because, if we can give them the quality which they need, the volumes that they need and the sustainability that they need, and they do not have to put their own hand into their pocket to make the investment, that is great from their point of view.
Chairman: Okay.

Q85 Mr Williams: The inclusion rate for biofuels is sometimes expressed as a percentage by volume and sometimes a percentage by energy. As I understand it, the RTFO target for 2010 is a given per cent by volume inclusion. The NFU have told us that they believe that is possible through home production, even though the inclusion rate at the moment is 0.3%. How realistic is the RTFO target for 2010?
Mr Hilton: I think the reason it has been capped at 5% at the moment is a very simple one: the Department for Transport do not wish to set a target that does not meet the current fuel spec. The European fuel spec is at the moment with EN228 for gasoline or EN590 for diesel, you can include 5% by volume, so it is merely setting a target that did not presume actions on behalf of Europe to change the fuel specs. I agree that it is possible, certainly in the ethanol context, that there is an export surplus of 3.5 million tonnes of wheat. This is feed grade wheat, if we convert to types of wheat specifically suited for making ethanol, we could produce 5.75% by volume of ethanol with the existing export surplus of wheat.
Mr Sutcliffe: Graham is right, 5%, just by volume, set at what you can put in every litre of diesel and petrol today. It is a start. It is not terrifically ambitious. The standard-setting bodies for Europe are already being mandated to move from 5% to

10% and there is really very little in terms of engine requirements to make that move. One thing we will be looking for is for the Government here to signal that they will be pushing the standard-setting body to move from five to 10%, and then we will set targets for biofuels to 10% when that move has been made. The only other thing I would like to say in terms of agricultural sourcing is, yes, there clearly is land across Europe that can be used for biofuels and we should make the most of it. I think we should also look at how, the biomass potential worldwide, which is quite considerable, can make that contribution, not just in this sector, but I am sure you will be looking at other sectors where there is that potential. So we should not be constrained by the set-aside production or the tenth of the land mass required from 5%. Clearly, we have plenty of potential land that we can use, but we should not set that as a short-term limit to making a more meaningful contribution to carbon reduction.

Q86 Mr Williams: I think the point that the NFU were making is that the 5% target is possible through domestic supply of material, even though we are only 0.3% in 2006.
Mr Sutcliffe: That is absolutely right, that agricultural potential is not a limit here, no.
Mr Hilton: I think it is one of the often neglected facts—and I am sure the NFU made great play of it—that the UK has historically had the most efficient arable sector in the world. That is without growing products specifically for biofuels. I think there is a huge ability to unlock additional benefits. I mentioned in my submission the National Non-Food Crop Centre, which could achieve an awful lot of things if it had a base processing industry to release agricultural co-products. There are an awful lot of efficiencies that will be unlocked from this industry, even if we go to two or 3% in the short term, because we will really be producing stuff. I think the industry will be inordinately more efficient by 2010, and part of the problem in predicating the efficiency of the industry at the moment is that it always suffers badly, when ten-year old information is used about biofuels and theoretical information is used about things like hydrogen, to kick-start the industry to whatever percentage will allow us to sit here in two years' time and have the discussion on real facts.

Q87 Mr Williams: The European Biofuels Directive is almost twice as high in terms of inclusion as the RTFO. If Britain were to achieve that, would that be done with more than just domestic production of material?
Mr Sutcliffe: I think across the piece we will see UK domestic production and feedstocks from around the world produced sustainably being part of the mix. The key to this is growing the overall cake for everybody, being competitive, as Graham says we are, and ensuring that, for example, our purchase of UK-produced rapeseed oil, which is, as I say, the biggest in the last 12 months, grows, so we have an interest in industry that can be supplied. Rather than focusing on a domestic versus imported, let us make sure we get an industry first, I suppose, that is competitive.

Q88 Mr Williams: You say that your purchase of domestic rapeseed oil is the highest in this country. What percentage of your total material is supplied by rapeseed oil?
Mr Sutcliffe: It is significant, and it moves between winter and summer so we have not given specific percentages—and I have to say it is not a great claim because there is not much of a biofuel industry here in the UK yet. That is really my point, getting the industry, getting the growth will mean there are more opportunities for UK agriculture to compete.

Q89 Lynne Jones: Both the Petroleum Industry Association and the World Wildlife Trust have told us that the CO_2 saved would be greater per hectare if, instead of emphasising biofuel production, biomass production were used for electricity and heat. What do you say to that? Why is there so much emphasis on biofuels and not that much on biomass?
Mr Hilton: As somebody with a significant interest in the biomass sector, there are a number of points I would like to make. The first is that it is not either or; there is actually a very heavy interplay between the two. For instance, there is a significant amount of straw generated by growing wheat for bio-ethanol, and the varieties of wheat that produce the highest starch and therefore the highest alcohol yield also have the longest straw, also have the lowest nitrogen fertiliser input, so there is a real win-win available in this. I am slightly cynical about the input of UKPIA—and I think it is applied also to the subject of carbon accreditation, where the biofuels and biomass industry were both adamant that their contribution to carbon savings should be independently audited. The reason that they have taken a slight step back from that, much to the puzzlement of an awful lot of Government officials and MPs, is that the oil industry saw that as a marvellous opportunity to delay institution of the whole industry, so that there has been a real battle going on, where I think a simple accreditation system could have been offered up by the industry but it has been abandoned because we saw it was being used as an obstacle for starting production.

Q90 Lynne Jones: We will move on to accreditation schemes later, but are you saying that, per hectare, if you are using a crop that you can use partially for biofuels and partially for biomass for heat and power, that you will save more CO_2 than using that exclusively for biomass?
Mr Hilton: I would refer to my earlier answer which is that my personal belief is that it is not either/or. I think if we made a decision now we would be guessing, and there has been far too much of that in promoting the bioenergy industry altogether. There is certainly a wood resource in the UK which is more than capable of providing all the biomass heating, which is my company's specific interest, and we

know that we can reduce carbon emissions by 40% of that achieved by even the wildest ambitions of the nuclear industry.

Q91 Lynne Jones: But it is a combination of heat and electricity that we are talking about.
Mr Hilton: Indeed. We think that heat is the most efficient use of wood, for instance, and that is what we are championing. I think the immediate availability of the technology to convert arable land into producing liquid biofuels rather than electricity or food, suggests that we should go down that road and then review things when we have real evidence. The majority of the environmental NGOs are now interested in having real industry in all sectors—then we can compare the figures. Until we do so, we are guessing, and taking a view on the environmental impact of biomass from the Petroleum Industry Association would not be the first place I would start. But you will have a chance to ask them.
Mr Sutcliffe: If I may add to that, I think it is not, as Graham said, a question of either/or, it is a question of and. We need to make progress in the transport sector in the same way we need to in the generation sector and the domestic sector. We need to make progress across all three sectors, so I do not think events say that we have to choose today between using land for heat generation, for example, in small-scale CHP or for crops or for transport use. We do know that the transport sector today—this is a measure that we can take—can make a significant difference to the sector but has made no progress to date.

Q92 Lynne Jones: Could we make a more significant difference by having greater fuel efficiency and also less unnecessary transport?
Mr Sutcliffe: Absolutely right. We need to do that as well. It is not a question of either/or, it is a question of and. We need to bear down on carbon emissions from cars, improve the energy efficiency in the domestic homes, ensure that the ROC mechanism in power generation is ever more efficient in producing renewables, but we cannot afford to say that just because energy saving light bulbs is the most efficient measure of carbon reduction—which I think it probably is, along with loft insulation—that we should somehow ignore the transport sector where we have made no impact at all. It is a question of: Get an industry up and running; make the savings. We may have a choice later on, whether if we start to look at land use we are having to make choices, but we are nowhere near that situation today.
Chairman: Mr Hilton, you may not have a couple of hours to spare, but, if you did happen to have a couple of hours to spare and were able to look through the evidence we took last week on the use of biomass for heating, the impression I gained was that people were almost thinking as they were giving evidence of little ideas to make it easier to use biomass in the context of heat. I walked away with the impression that it was getting into what I call "the all-too-difficult column". You give a much more positive impression that it can be done and there are not too many barriers to progress. Perhaps you might have a look at last week's evidence and tell us if there are some ways of removing the barriers which our witnesses last week erected in terms of biomass for heating. That would be very helpful to us.

Q93 David Lepper: Before I come back for a moment to this question of 5% by volume target, could I take you back to the beginning of your evidence. You talked about the pluses and the minuses of current policy and mentioned the five departments involved in policy making, with no leader among them. If you had to nominate one of those departments to be the lead department, which would it be?
Mr Hilton: I think for road transport fuels it would be the Department for Transport; for biomass from heat I think it would be Defra. It is partly the number of departments but it is also the approach that I think is one of the obstacles. If I had to say the two things which are most difficult, it is knowing who to talk to but also knowing what the alternative will be tomorrow. I think the biggest single difficulty here—and it goes back to the previous question in terms of land use—is a tendency by Government to try to micro-manage. I think, as a result of that, there are very strict definitions of things like biomass, and what is and is not specifically grown biomass. An example of that which we saw a couple of years ago was the ARBRE project which, let us not forget, had absolutely zero impact—certainly zero positive impact on carbon—because somebody had prejudged that some things should be appropriate biomass and some things should not be. There is a terrible tendency to say to industries—who are prepared to risk their money, and you can call it losses or investments but they are actually the same thing. They will invest in what they believe are technologies that have a long-term possibility; they will make those choices to hit the targets that they are given. The danger with an awful lot of what goes on at the moment is that we are told we are going to go from London to Manchester but we should first go via Brighton, Oakhampton and a thousand and one other places along the way. I think that in itself is a major mistake, and when you have three or five different people supplying the road maps it becomes singularly unhelpful.

Q94 David Lepper: Mr Sutcliffe, do you share those views?
Mr Sutcliffe: To be honest, you are the experts in government machinery.

Q95 David Lepper: Oh, yes!
Mr Sutcliffe: All I am looking for is outcome which is clear and ambitious.

Q96 David Lepper: Okay. So it is knowing who to talk to at the right moment, the paths of connection, that are important.
Mr Hilton: I think history suggests—and I have been involved directly in trying to address Government objectives on biofuels for three years now—that just when you think you have delivered what you are being asked for, the goalposts move.

Q97 David Lepper: Could I come back to this question of the 5% inclusion level. I am just wondering what your view is of the role of the vehicle manufacturers here in the UK and the length of engine warranties that they offer on driving up standards here. You talked about the move to push up from 5% to go beyond that, but are we stuck with a situation where there is a kind of timidity on the part of manufacturers?
Mr Sutcliffe: I think moving up from five to 10% is not a big technical issue. Clearly, if you were an engine manufacturer, why would you do it, if it might increase your costs or if you would need to change you warranty claims? I think they are looking for a strong steer from Government, be it at the EU level, and then they will make the change necessary. They are happy to do that, I am sure.
Mr Hilton: In terms of fuel distribution and motor car, it is very similar to unleaded. I think everybody has to go at the same time. An awful lot of the motor manufacturers say their cars will run on 10% now, but I think inconsistency again is the nightmare here, that if you turn up in a ten-year-old car to a filling station, not knowing if the fuel in that filling station is appropriate for your car, everybody has a headache about it. But I think those things are well in hand and our understanding is that the European standards bodies are already looking hard at a move to 10%—and I think that is everybody's assumption; we just have not embodied that in policy at the moment.

Q98 Chairman: Is that 10% by volume?
Mr Hilton: Yes.

Q99 Chairman: I just want to go back to a little point you made earlier: I wonder if you have any impression that part of the business of the project or the Government's position reflected the fact that departments had been told by the Treasury that there was only so much money to go round and this had been spread out over the various bio options.
Mr Hilton: No, I think the 30 pence cap on a combination of buy-out and duty . . . . The 30 pence cap started when we had 20 pence duty derogation. At that time, with much cheaper oil, industry said to the Treasury they needed 27/28 pence. That figure has got locked in somewhere, so that there is now a view that 30 pence is generous and I think the 30 pence cap is a complete accident. If the 30 pence cap is announced in the Budget, it would be disastrous. My personal view on the reason it is there is that the messenger does not want to get shot—and that messenger, for the record is DfT. They believe you can add the two things together. I believe that is a fallacy. So they have taken the 30 pence which would have been a comfortable support level—with which I think we all agree—and said, "You can get to a 30 pence total by adding buy-out and duty together," and you cannot.

Q100 Chairman: That is why it would be disastrous.
Mr Hilton: It would, yes.
Chairman: Well, in one week's time, we will know whether it is a disaster or not!

Q101 James Duddridge: I have a question for Mr Hilton. The Energy Crops Company supports a number of different support mechanisms for renewables, on the one hand an obligation for biofuels and capital infrastructure grants for biomass. Why not a renewable heat obligation?
Mr Hilton: For the record, the Energy Crops Company does not necessarily have a view on the Renewable Transport Fuels Obligation; I personally do and have been heavily involved in it. As regards heat, the reason we do not favour an obligation mechanism for heat—and I quite agree with Sir Ben Gill on this and the findings of his task force—is that the delivery of heat is a very fragmented operation. Heat can be delivered to a house by pretty much any fuel available. The duty approach to those fuels is completely different. Some of them are subject to other carbon penalties and the way that an obligation works in principle is to oblige the suppliers, who are clearly identified, to provide a percentage of renewables or to face certain penalties. That works evidently in the electricity market: it is easy to identify the supplies; they are at an end of a wire and invariably at very large facilities. In the oil industry or road transport fuels industry, there is a duty mechanism whereby the vast majority of fuel is supplied by a limited number of suppliers who have a relationship with Her Majesty's Revenue and Customs, so an obligation can very easily be put on them and it can be measured. In the heat market it is completely different. My view is that you would end up trying to come up with a mechanism that would apply equally to a small independent LPG supplier, a small wood merchant, BP, Shell, Centrica. It would be an administrative nightmare and would have to take account of existing penalty and support mechanisms for a whole range of fuels. The other reason I am not sure it is entirely necessary, and this is part of my optimism for biomass—and I will certainly look at last week's evidence and feed back in anything that I believe is either false or for which we have some new solution—is that we believe biomass heating can be cost competitive. We started to look at this when we were not cost competitive as a fuel with oil. We now are. The obstacles that we face at the moment are short-term cost of capital requirements, and we support capital grants in biofuel because we believe that once people feel comfortable that they can buy reliable biomass burning equipment—initially with grants to offset its higher cost to oil and gas equipment, and with reliable fuel supplies, which is our objective—the volume will start to bring in economies of scale and the whole provision of heat by wood will be competitive in all cases with oil, in all cases with LPG and in many cases with gas. That will need to happen because planning rules are starting to insist that new developments consider biomass heating, and that would be a nonsense if biomass heating was not economically and reliably available.

Q102 Mrs Moon: You talked in terms of administrative nightmares. Lots of people have talked about carbon certification schemes, and I think, Mr Sutcliffe, it was one of the issues you

addressed as well in your submission. One of the things the RSPB and English Nature talked about was the need for carbon certification to ensure that the move to energy crops did not damage biodiversity and the wider environment. You have talked about a whole life-cycle analysis and compulsory reporting. Can you say who you think would be responsible, how the costs of it would be covered and how you would regulate it.

Mr Sutcliffe: This is an extremely important area. I am going to cover both carbon certification and sustainability, because I see them as linked. The first thing to say is that today we do not have an industry. We need to get an industry and then we can make it better. The oil industry has been around for a long time and we are trying to compete with that, so we need to make a start. On carbon certification, in particular, we have done a life-cycle analysis on the feedstocks we have of round about 50% greenhouse gas reductions, but the data is relatively low quality because not much research has been done on this; in particular, the nitrous-oxide emissions due to agriculture and fertiliser. The first thing to do is to create the data and the experience of an industry in how we can do. The second thing to do is to make it better. I think one of the dilemmas that we face is, on the one hand, to get industry up and running with the carbon reduction as a key measure and to ensure that we do get first generation biofuels in place, but, at the same time, to look towards the future and having to take that industry and improve it as we go forward. Step-wise, there are many things we can do. We agree with the aims of the RSPB, for example, on saying that we are trying to get carbon reduction, but if we make the scheme over-complicated and over-data-intensive we simply will not make the start that we need to make. The same is true on sustainability, where, as I have said, we will be using a mixture of rapeseed oil, palm and soya, and, as you know, for example, palm oil has some difficulties in sustainability terms. This is a very large industry today and it has been responsible, amongst a number of other things, for rainforest destruction—it is not the only reason why there has been rainforest destruction, but it is one of them. From our point of view, there is really no point in having a company which is creating an environmental solution to an environmental problem if we do not have a sustainable business. We need to make sure that the products we are sourcing are going to be sustainable, otherwise there is no point in doing it, but that cannot happen overnight because we have existing supply chains/production and at the moment we are a very, very small part of the market. For example, if you take the UK requirement for biodiesel, it is a fraction of a per cent of world palm oil production, so once we are in place we can start to influence the industry from a place which we cannot until we have got started. But we have made steps, for example, in line with what Friends of the Earth are saying, to engage with the industry through the Round Table on Sustainable Palm Oil, and WWF, who were also mentioned earlier, are also a sponsor of that, with engaging with the standards in the UK to make sure we get those sustainability standards in place. I do not think we, as a company, can afford to wait for environmental standards to be put in place before we act, because we need to be ahead of the game rather than behind it, so we will be looking with our key suppliers to ensure that we are going ahead of that process and getting our first sustainable palm oil or soya bean oil or rapeseed oil this year rather than down the track. I would say about that, of course, that that will be the first sustainable palm oil around, well ahead of the food industry, the pharmaceutical industry, the soaps industry, which have been the basis of this industry for some 20, 30, 40 years. I know many people around this room have mailbags or concerns about that and I share their concerns. We are going to be the mechanism to ensure that we have an industry that is sustainable as opposed to the historical perspective. I think that is a very important point, because if we do not get an industry up and running based on a range of feedstocks and then make it sustainable, we think we will not be getting the opportunity—and it is not just an opportunity for low carbon; it is also an opportunity, if I may be so bold, to ensure that we do not stifle economic development in these countries where they can provide products to the UK in a sustainable way and we are not putting up trade barriers, non-tariff barriers to stifle development. We are going to do this, we are going to be dong it sustainably, and we are going to be driving towards a low-carbon solution, but it is going to take time a little bit of time to get that in place. I am hoping for encouragement from this Committee as we go along that path as a very small player, as opposed to people saying, "We see the problems and we do not want you to do it at all."

Q103 Mrs Moon: Are you talking about it being self-regulated?

Mr Sutcliffe: From our perspective, if we do not have a sustainable business model which is driving towards lower carbon, we have no business, so it is a business imperative for me. There will be mandatory reporting within the RTFO framework. That is fine, but there is no point me waiting until 2008 to do that; I need to do that much, much earlier.

Q104 Lynne Jones: You are arguing that you cannot be influential until you are a bigger customer for palm oil, but by becoming a bigger customer you are massively increasing the demand for palm oil. Do we not have a problem there? Are all the other clients of palm oil signing up to the Round Table? What proportion of the production of palm oil is to producers who have signed up to the Round Table?

Mr Sutcliffe: That is a very interesting point. As I say, we are looking at a fraction of a per cent of palm oil production. Do not forget, we have other feedstock as well. That is the one with the focus on it, but there are other crops—soya, as well, which is a little bit behind, in my view. We have bought significant palm oil, which means our suppliers talk to us. We have just started producing and therefore we are a little bit ahead of the game. We joined the

RSPO[1] last October/November. It is interesting to see that this year two of our major suppliers, Kuok (palm oil) and Glencore (soya and palm oil suppliers to us) have both joined the RSPO. Two biofuel users, Greenergy and BP, have both joined this year, and, interestingly enough, two major supermarkets in the UK, Waitrose and Asda, have also joined this year. It may be, in a sense, the energy market, which has to do this right, is being a driver for change across the whole industry. It is not true to say that the amount of palm oil needed is going to be out of proportion to the existing industry. This is about changing the industry structure so there is no need to destroy the rainforests. It does not need to happen; it simply does not need to happen if we give the right signals and standards around it. For example, I was talking to somebody from Oxfam today who says that there are 11 million hectares in Indonesia of the grade of land that is suitable for palm oil, which would be equivalent to five times European requirements for biodiesel by the end of the decade if it was all palm—which it never would be because we need all the different food stocks—so we do not need to do in the future what the food industry has done in the past in destroying rainforests to serve food and energy crops. It just needs a little bit of will to make it happen.

Q105 Lynne Jones: What sort of inspection regime is in place to ensure that production is according to the code laid down by the RSPO?
Mr Sutcliffe: Today there is not, because this process has started. We are a small company with 50 people. I sent two people out to the first verification working group meeting last month, but also talking bilaterally with supplier to say, "Let's not wait for that, let's get our first certified cargoes by the end of this year," which will be well ahead of any formal requirements, and clearly we would put in place verification to make that happen.

Q106 Lynne Jones: Who is doing the certification?
Mr Sutcliffe: We could use external auditors to do that. For example, if you were doing environmental ISO14,001 certification, there are plenty of groups who can do that, or we could use our own internal auditors.

Q107 Lynne Jones: You do not know what proportion of palm oil production is for the customers who signed up to RSPO, you just know that it is a growing proportion.
Mr Sutcliffe: Yes.

Q108 Chairman: You just made reference to the size of your enterprise. Could you give us some numbers? At what kind of production are you at the moment, and how does it build up? When does your business model that you put to your investors indicate that you come into profitability? When do you start making some money out of all this?

[1] Roundtable on Sustainable Palm Oil

Mr Sutcliffe: I am afraid I cannot give profit forecasts; otherwise I should be having to make an announcement on the Stock Exchange—or even production forecasts. We have started and we will be moving towards a production level of 250,000 tonnes per annum, which accounts for 1% of UK diesel requirements.

Q109 Chairman: When will you—
Mr Sutcliffe: Over weeks and months, rather than a longer time frame.

Q110 Chairman: Where is your product going to? You alluded to some supermarket customers.
Mr Sutcliffe: The product will go to UK and European companies, refiners and distributers, and we are talking to a number of other players who obviously need to find sources of supply for when the RFTO comes in in 2008. They are keen to take test quantities as well of a few thousand tonnes or so, because they will need to do this when the measure comes into place.

Q111 Chairman: You are representing 1% of the market. Where is the rest of the supply going to come from?
Mr Sutcliffe: That is 1% of UK diesel requirements, or, if we say 3% for 2008, that is one-third of the UK requirements in 2008.

Q112 Chairman: Who is going to provide the other two-thirds?
Mr Sutcliffe: With the right signals, in Teeside, in Seal Sands, I have space for another plant, and I would love to make that investment.

Q113 Chairman: You could go a bit more.
Mr Sutcliffe: Absolutely.

Q114 Chairman: But there is room for other people. Do you think we are being ambitious enough with our bio crops approach? The Swedes have indicated that by, I think, 2020 they want to be out of oil, which is an unbelievable objective. But, if they have said they are going to do it, they will do their best to do it. Are we being a bit sort of timid really about what we are trying to do?
Mr Sutcliffe: I am just a businessman trying to have a business where I can make investments and it has some long-term sustainability around it, so I am looking for some concrete measures which support the investment out to 2015, as opposed to aspirational goals beyond that. That is the basis on which I invest.

Q115 Chairman: I am asking both of you, as people who are knowledgeable about this. Clearly, from the Swedish point of view, they will look at everything that is non-oil, and it is a remarkable objective to have. I am coming back to the problem that has bedevilled the transport sector: with rising greenhouse gas emission, are we being ambitious enough both in the transport and other sectors about the use of biofuels to address the recent growth in greenhouse gas emissions? Because, so far,

this conversation has been bounded by the likely targets that have been set either by the European Union or by the United Kingdom Government. Could we do more?

Mr Sutcliffe: I think the measures are unambitious and we believe that it is a good first step. We should do more. We should signal today that we will do more in terms of growth beyond 2010. That is one element of the ambitiousness. The second is: let us make sure that the incentives that are put in place are vigorous enough to make sure this is a target we hit, as opposed to many of the carbon targets which we have singularly failed to hit.

Q116 Chairman: Mr Hilton, is there anything you want to say by way of a postscript?

Mr Hilton: No. I would agree with Sean that they are unambitious. I do see benefits to a review in the future based on solid facts. In the past, the UK has had a tremendous reputation for innovation and its reputation for implementation has been sadly somewhat behind that and I think we have brought an awful lot of novel technologies and novel business approaches to the market that have been exploited by other people. I think the great tragedy would be if the underlying agricultural resource was allowed to reduce just as our demand for it was coming into focus, and I think under the new SFP system—I am sure the NFU were very vocal about this last week—there are significant amounts of agricultural land being taken out of production. Some people believe that is a positive thing and will aid biodiversity. My view is that the way to manage farming is to make environmental conditions part of the condition of profitable farming which, with a vibrant bioenergy sector, we will have, rather than again the micro-management led by subsidy which achieves no lasting benefit and leaves Government as the technical arbiter. I think, sadly, history has suggested it is not best suited to perform that role.

Q117 Chairman: Thank you very much indeed for some stimulating and interesting answers to our questions and also for the very considerable amount of work that you both put into your written evidence, for which we are most grateful. I am sorry, Mr Hilton, to have set you a little homework task, but you have been very positive this week about your area of biofuels. Last week did seem a bit difficult, and if you could help us to remove some of the roadblocks it would be extremely helpful.

Mr Hilton: It will certainly help us to make some major investments in the near terms, I hope. Thank you.

Supplementary memorandum submitted by the Energy Crops Company Ltd (Bio 06a)

These comments relate to the apparent discrepancy between my own apparent optimism regarding the prospects for Biomass Heat, expressed during my evidence before the committee on the 8th of March, and the more pessimistic views of the REA in their evidence one week earlier.

The latter pessimism was characterised by the Chairman of the committee in Q56 as verging on the "all too difficult".

I feel there are a number of reasons for our different views, broadly split into the following categories.

1. The members of the REA are understandably reluctant to abandon existing support mechanisms without some certainty of new support.

We have the benefit of starting with a clean sheet of paper, looking at the underlying competetivity of biomass fuel with fossil fuels today.

2. Despite their frustration with Government constantly gravitating to Electricity as at the expense of other energy uses such as heat, much of the evidence reverts to examples on electricity, CHP, district heating and the like.

There is a huge market for pure, efficient heat at the point of consumption which may be served by biomass, this is often lost in inefficient or expensive district heating models.

We believe that biomass boilers, and the uses to which they are put should be assessed separately.

3. In similar vein to 2, above, it seems that some secondary support is envisaged by community or public bodies championing the use of biomass. This betrays an underlying problem of looking at everything from a "project" perspective, where the business models, financial security and often physical design are "bespoke" to a fairly large degree.

We believe that the future lies in developing a mainstream offer, where biomass boilers will be standardized, and homogeneous pellet fuel will be offered with the security and convenience equivalent to heating oil today, but at lower cost.

4. Financial security is often raised as a big issue. In other markets this is dealt with by processing or consolidation companies buying from small suppliers, and supplying a wide range of end consumers. The biomass model often envisages micro supply chains with small woodland owners supplying large hospitals for instance. This will create financial, risk and quality issues.

We intend to offer secure affordable supply to satisfy large and small customers, from a range of suppliers. While incurring a small energy and cost penalty, this will create a homogeneous fuel to encourage customer confidence, backed by large company logistics and financial security.

5. Existing grants are delivered via installers, and ensure that equipment works. This system does not promote efficiency or fuel supply. Grants are given equally to boilers which work on rare occasions in a country house and to a municipal swimming pool where usage, fossil fuel displacement and carbon saving would be much higher. Similar problems bedevil infrastructure grants, witness Welsh Biofuels.

I have sympathy with the REA members who have worked for many years to develop the industry, with projects only viable after grants, and understand why 40% grants seem preferable to 22%.

We would like to see a continuation of the adequate existing grants, with a forward reduction in their per cent level encouraging greater standardization. In addition we would like to see some shift to market mechanisms based on unit carbon savings, ie tied to the amount of fuel supplied through a supported facility or to a supported boiler.

We believe this will allow reduced costs, and use of consolidated savings within mechanisms such as the European Trading System in future.

Overall, by concentrating on displacing heat from oil at the point of use, with a commercial approach, and existing technology, we believe biomass can become self sufficient and universally available in short order.

A mainstream approach, and professionally consolidated fuel supply will help to trigger this move.

The Energy Crops Company Ltd

March 2006

Memorandum submitted by UK Petroleum Industry Association (UKPIA) (Bio 25)

The UK Petroleum Industry Association (UKPIA) represents nine companies engaged in oil refining and marketing in the UK. Our member companies supply most of the transport fuels and other oil related products used in the UK. As such, we have a major interest in the topic of bio energy—covering bio fuels and biomass—and welcome the opportunity to respond to the Committee's consultation on this important issue.

Our more detailed responses are confined to those questions where we have specific knowledge or expertise, particularly in relation to bio fuels.

SUMMARY

UKPIA's views can be summarised as follows:

- The oil industry believes that due to their low cost, availability, and ease of use petrol and diesel will remain the dominant road transport fuels globally to 2030 and beyond, a view that is shared by the International Energy Agency in their forecasts of future energy use.
- The industry takes seriously, and is closely involved in meeting, the challenge of reducing greenhouse gas emissions. Savings are likely to come from a range of options, across all sectors, including new technology, bio energy, renewables, increased energy efficiency and changes in consumer behaviour.
- The oil industry is actively developing and/or deploying new technology which will reduce emissions of greenhouse gases such as biofuels, wind, solar, carbon capture and storage, hydrogen and also fundamental research. Energy efficiency is also being improved in our operations for example by installing gas fired CHP in refineries.
- We are currently working towards meeting the Government's target of replacing 5% of road fuels by biofuels by 2010 under the Renewable Transport Fuels Obligation (RTFO). This will require significant investment by the industry at refineries and in the supply/distribution chain.
- We believe that it is important that the RTFO should be applied in a way that helps the future introduction of advanced bio fuels that have the potential for larger greenhouse gas saving, lower costs for the consumer and open up a range of new sources of biomass, including waste.
- The Government's targets should be achieved by deploying the most cost-effective measures first. This will ensure that the UK remains competitive by meeting its targets at the least cost and develops the technology that is most likely to be taken up by other countries, so creating opportunities for UK business.

— For biomass this would mean extending its use from transport fuels to heat and power generation where studies by a number of groups, including the DEFRA Biomass Task Force lead by Sir Ben Gill, have highlighted the higher potential and lower cost per tonne of carbon saved. This application may also be of greater benefit to the UK's security of energy supply than conversion to liquid road fuels.

— The oil industry believes that biomass produced in the UK and overseas can contribute to reducing emission of greenhouse gases and that the use of biomass as a source of energy will grow in the UK and elsewhere.

— For the medium term the industry is working with others in the European Standards Organisation, CEN, to look at changing the current limits on biofuels in the road fuels standards.

— UKPIA believes that the UK's energy policy should continue to be based on maintaining a reliable UK energy system meeting all three pillars of sustainability: economic, environmental and social—and not dominated by any one of them. Sound science should be a cornerstone of this policy to ensure goals are met cost effectively.

Responses to Questions Posed by the Select Committee

Q1. *What is the real scope for biomass and bio fuels to contribute to tackling climate change? and what proportion of the UK's energy and transport fuels could they provide?*

Energy crops

1.1 The UK can grow a number of different crops for use as a source of energy. The area of land available is a determining factor for UK production, with indications that about two million hectares could be given over to energy crops without affecting food production. In addition wheat and waste products currently exported, could supplement production. Beyond this level, major change in land use—for example grass or woodland cultivated for energy crops—could change the CO_2 balance:

Potential energy crops include.

— Rape seed which can be converted into bio-diesel.

— Sugar beet which can be used to produce ethanol by fermentation.

— Wheat which can be used to produce ethanol by fermentation.

— Miscanthus which can be burned to produce heat and power.

— Wood from short rotation coppicing which can be burned to produce heat and power.

The area of land available to cultivate energy crops is the primary determining factor, without displacing land for food/grazing (see 1.11 below).

1.2 Bio-ethanol can be converted into ETBE (ethyl tertiary butyl ether), a high octane product, which can be blended into petrol at a refinery without any of the water pick-up and vapour pressure constraints resulting from blending ethanol into petrol, especially in the summer.

1.3 Wheat and corn yield in the order of 2.5 tonnes of ethanol per hectare; sugar beet has a much higher potential, in the region of four tonnes per hectare. The actual yield will depend on the quality of the land used, amount of fertiliser, although the latter can be a significant factor in input cost.

Other Sources of Bio-fuels

1.4 A number of waste products can also be converted into energy or fuels eg used vegetable oil into bio-diesel, straw and forestry waste into heat and power, etc. However, like other biomass fuels, the challenge for waste products remains one of "chicken and egg". Greater utilisation of potential UK production from these sources and development of a reliable supply chain is currently limited because of the lack of end-use plant, apart from plant converting used cooking oil and tallow.

1.5 In the longer-term woody waste, straw and other cellulosic material can be converted to bioethanol using enzyme type technology or diesel by partial oxidation—so called advanced biofuels. Processes for both these options are currently under investigation/development, with ethanol plants likely to be constructed in Germany and Spain. However, they are not yet available commercially.

1.6 The technology to convert woody material and green waste to bio-ethanol using enzymes as catalysts is at the demonstration phase with the largest plant believed to produce about eight tonnes per day of bio-ethanol from about 40 tonnes per day of straw. However it will be some time yet before the process will be demonstrated commercially.

CO_2 reduction

1.7 The Government estimates that emission of about one million tonnes of carbon per year will be avoided by the RTFO when fully implemented at the 5% level in 2010. The overall carbon saved very much depends upon the type and source of material and the production process involved. A joint report by Concawe, the oil industry's European environmental research group, European Joint Research Centre and Eucar, surveyed published information to estimate the potential saving in carbon dioxide per hectare of crops grown for a number of different crops. The greatest saving was when the crop was used to generate steam for heat and or power.

Table—Carbon dioxide emissions abated by the use of current biofuels

Crop	*Carbon dioxide saved*
Bio-ethanol from sugar beet for blending with petrol	3.8 te/ha
Bio-ethanol from wheat for blending with petrol	1.3 te/ha
Bio-diesel from rape seed for blending with diesel	2.0 te/ha
Biomass (SRC or miscanthus) used to raise power	16.0/te/ha

Source: Concawe/JRC/EUcar

1.8 This indicates that producing liquid road fuels is not the best use of land in terms of reducing CO_2 emissions.

1.9 An alternative is to use the biomass as a fuel to raise steam and produce electricity or combined heat and power. The processing required is considerably simpler and the crops can be selected solely on their ability to produce large amounts of biomass from a given land area. Such crops could include various grass varieties, or fast-growing wood (short rotation coppicing). Adapted grass varieties can produce some 200 GJ/ha of net biomass energy (ie after accounting for the production energy), compared to 30 to 60 in the best scenario for RME or ethanol. When used for power generation this could displace an equivalent fossil fuel energy with a CO_2 emission factor of say 80 kg CO_2/GJ (typical of heavy fuel oil or intermediate between gas and coal). This would equate to 16 te CO_2/ha, four to eight times more than could be achieved through RME or ethanol.

Meeting energy and transport fuel needs

1.10 Currently UK sales of bio fuels amount to approximately 120 million litres per year, including imported material, particularly ethanol, equivalent to less than 0.3% of conventional petrol and diesel use. It is estimated that about 100,000 hectares of land is given over to biofuel crops.

1.11 Under current European Fuel Standards, the maximum limit for blending of bio fuels with conventional petrol and diesel is 5% by volume. EU Directive 2003/30/EC also established an indicative target for bio fuels of 5.75% by energy by 2010. A European standard has been developed for bio diesel (EN 14214) to ensure product quality/stability by requiring vegetable oils be converted to fatty acid methyl ester (FAME). A similar standard for bioethanol is under development.

1.12 Meeting the EU Biofuels Directive would create a UK bio fuel requirement of approximately three million tonnes per year, requiring in the order of 1.75 million hectares of land given over to production of biofuel crops. This is close to the two million hectares of available land indicated in a 2002 report from DEFRA without affecting food production. The amount of land required might be reduced if wheat and sugar currently exported was used to produce bioethanol.

1.13 This indicates that domestic production of bio fuels could substitute between 5–10% of conventional petrol and diesel, provided limited land is used to grow crops for power/heat.

Table—UK land area to produce 5.75% (by energy content) biofuels by 2010

Crop	*Product*	*Typical biofuel yield*	*Land required*
Wheat (50%)	Bioethanol	2.5 tonnes/ha	0.36 mio/ha
Sugar beet (50%)	Bioethanol	4.0 tonnes/ha	0.23 mio/ha
Rape seed	FAME biodiesel	1.1 tonnes/ha	1.15 mio/ha

Source: Sheffield Hallam University for DEFRA

Q2. *How cost-effective are biomass and bio fuels in comparison with other sources of renewable energy?*

2.1 As outlined in the response to Question 1 above, different energy crops can be used to produce heat, electricity or road fuels. In a situation where available UK cultivatable land is limited, optimum use is an issue. The current focus is very much on the use of available land for the production of motor fuels. This may not, however, represent the optimum use from either an energy or greenhouse gas emissions point of view. The costs and benefits will therefore vary from case to case.

2.2 In general, alternative fuels (bio-diesel, bio-ethanol, etc) are more expensive than conventional fuels—up to 2-3 times (Energy Review 2003). However, the rise in crude oil and refined product prices over the last two years has narrowed this gap. By way of illustration, the average ex-refinery cost of a litre of unleaded petrol in the UK last year was 22 p/litre. Comparable published data (AEA Technology report for DEFRA 2004) for bio ethanol processed in the UK from Brazilian cane sugar or UK sugar beet was in the range of 34 to 43p/litre (2002 cost). The cost of ethanol from Brazil is likely to be on third lower. Generally, the higher cost of producing renewable fuels has prevented their widespread use in the past and with the recent rise in price of petrol and diesel, this could have an additional cost impact for consumers.

2.3 Currently bio diesel and bio ethanol attract a 20p/litre lower duty than conventional petrol and diesel (47.1p/litre). There have been calls for an increased differential but there are signs that the market is already picking up, stimulating the construction of new UK biofuel plants (bio diesel and ethanol) in 2005 and 2006. The RTFO when introduced will boost this demand further.

Cost of reducing greenhouse gases (GHG)

2.4 Avoidance cost of CO_2 emissions from biofuel depends on the way it is produced. The Table below gives indicative ranges.

Option	*Cost of reducing GHG £/teC (crude oil $25bbl)*	*Cost of reducing GHG £/teC (crude oil $50bbl)*
Bioethanol from wheat, sugar beet	450-900	245-605
Bio diesel from rape seed	400-615	230-320

Source: Concawe/Eucar/JRC

2.5 The Markal model studies carried out for the Government as part of the 2003 Energy White Paper reached a similar conclusion as bio fuels play a small part in the scenarios to reach a 60% reduction in emissions of carbon dioxide by 2050. Their use in the model appears to be largely due to the lower cost of bio fuels whilst they receive a duty subsidy.

Q3. *How do bio fuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?*

3.1 So called "well to wheels" analysis is essential in comparing the carbon savings from different energy sources from production through to end-use. The table below gives some comparisons of petrol, diesel, bioethanol and biodiesel (5% blends) using conventional vehicle technology (ie i/c, spark ignition or compression ignition, non-hybrid).

Table—Wells to Wheels Greenhouse Gas Emissions

Fuel	*Wells to Wheels Greenhouse Gas Emissions g CO_2 equivalent/km*
Petrol	196
Diesel	164
Ethanol (95/5) from sugar beet	193
Ethanol (95/5) sugar cane (Brazil)	188
Biodiesel (95/5)	160

Source: Concawe/JRC/Eucar 2005

3.2 The exact savings are highly dependent upon the source of the biomass used, the production process and whether by-products can be incorporated or waste used to produce heat and power.

Q4. *Not all biomass is equal—potential carbon savings depend on farming practice. What can be done to ensure energy crops are sustainably produced?*

4.1 Cost of biofuel feedstocks is an important factor in the production of bio fuel blends. The AEA Technology Report for the Department for Transport in 2004 indicated that the lowest cost bioethanol was produced from Brazilian sugar cane and US corn. There are signs that increased demand for these products for export markets is starting to increase domestic prices of ethanol in producing countries, as well as sugar prices. In Brazil 52% of the sugar cane crop is going into ethanol production compared with 48% in 2003 (Source: International Sugar Organisation)

4.2 As demand increases there is likely to be pressure for increased land area to be developed for energy crop production, with the risk that previously virgin land is cleared for cultivation, although this is less likely to be a problem in the UK and EU. However, changing land use either overseas or in the UK to satisfy demand for energy crops, could change the CO_2 balance either by releasing CO_2 by alternative cultivation or reducing the vegetation available to absorb it.

4.3 The oil industry feels that an accreditation scheme should be developed to ensure that greenhouse gas savings are delivered and unacceptable environmental impacts avoided. The oil industry is participating in the development of an accreditation scheme by the Low Carbon Vehicles Partnership.

4.4 The RTFO announced in November 2005 recommended that an environmental assurance scheme be developed and integrated into the RTFO to ensure that the fuels supplied offer real environmental benefits. However there will be difficult challenges to overcome before such a scheme is working effectively. Hence our support for the Governments decision to initially require only reporting of greenhouse gas savings, sustainability, etc under the RTFO.

Q5. *What impact will UK Government and EU actions have in increasing demand for and production of biomass and bio fuels?*

5.1 The potential impact of the RTFO and EU Directive 2003/30/EC on demand for bio fuels is outlined in response to Question 1 above.

5.2 In the UK it is likely that interim limits under the RTFO will be applied before 2010 further boosting the demand already stimulated by lower rates of duty introduced in 2003 and 2005. Some of this demand is being met by imports, particularly bioethanol from Brazil, but could be substituted from UK production once new, competitive, processing plant/ crop supply is established.

Q6. *What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?*

6.1 Government policy background in the 2003 Energy White Paper indicated that renewables had a vital role to play in reducing carbon dioxide emissions and set a target to generate 10% of the UK's electricity from this source by 2010. A major focus has been upon wind energy but as the Biomass task Force report in October 2005 highlighted, there is considerable potential to develop biomass in power generation. This route holds greater potential for CO_2 reduction than conversion of biomass to liquid fuels for road transport.

6.2 The White Paper also indicated that a 5–10% reduction in CO_2 emissions from road transport will be required by 2020. This is capable of being achieved from improved fuel economy from conventionally fuelled vehicles allied to new technology. This view is supported by the fact that UK road kilometres driven have risen by 20% since 1990 but overall fuel demand by 8%. The challenging longer-term aspiration of a 60% reduction by 2050 will likely require a combination of measures, with a move to lower carbon fuel sources, new technologies such as carbon sequestration, allied to major change in consumer choices/ behaviour.

6.3 On road fuels, the Government has introduced a financial incentive of a 20p/litre duty reduction which is stimulating demand. Some of this demand is being met initially by imported material. As outlined in the response to Question 2, this level of subsidy would have to be on-going without the RTFO as, generally, experience shows that consumers have not taken up alternative fuels if the costs are greater than for conventional ones.

Q7. *What impact might an increase in energy crops in the UK and the EU have on biodiversity, production of food crops and land use and the environment more generally?*

7.1 In the UK, an increase in energy crops to a level meeting the 5% limit proposed in the RTFO could have an impact on intensity and diversity of agriculture. It could also have an effect upon biodiversity as it implies that this level of demand will be met from land set aside being brought back into production. It could also have an impact upon food prices if UK land is given over to producing energy crops and potentially result in more food requirements being imported with a resultant impact upon transport miles.

7.2 Meeting demand beyond the limit of 5–10% implies a combination of UK land currently dedicated to food production being turned over to energy crops or greater imports of biofuel feedstocks from other EU or non EU countries.

7.3 In the UK, this could have an effect upon the environment and biodiversity through greater use of fertilizers/pesticides and a trend towards monoculture. In overseas countries particularly outside the EU, it could lead to the destruction of forest to cultivate crops such as cane sugar and soya.

7.4 For this reason, the industry supports the development of an accreditation scheme to ensure that the carbon saved from different types and sources of bio fuels can be measured and that they are grown from sustainable sources. Such an approach should not be seen as a barrier to developing a viable bio fuels market in the UK.

Q8. *Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined fuel, from outside the EU?*

8.1 The production of rape seed, wheat and sugar beet is conventional farming. The cultivation of short rotation coppicing or similar new crops does not pose any significant problems.

8.2 The barriers to UK production are the availability of good quality set-aside land and sufficient process plants to convert, say, rape seed into bio-diesel or burn wood from short rotation coppicing, etc. This situation for bio diesel and bioethanol is changing as demand increases, stimulating the construction of new processing plants that are tied in with contracts to supply raw material.

8.3 Proximity to market is an issue when looking at the carbon balance and economics. This is especially true with biomass for heat/power generation, where weight and mass of the raw material means it is uneconomic to transport it over long distances.

8.4 The Biomass Task Force report indicates that about one million hectares of land for non-food cultivation is available over and above that currently cultivated in this way.

8.5 In an open market there is no guarantee that the bio-ethanol and bio-diesel used in UK road fuels will be all sourced from the UK. Brazilian farmers can produce bio-ethanol from sugar cane and Malaysia farmers can produce bio-diesel from palm oil. Products from these counties are potentially cheaper than UK sourced material due to their more favourable climate, established large scale production and efficient use of waste by-product.

8.6 The new EU Member States may also have the potential to become significant suppliers from within the EU, benefiting from available land mass, lower wage costs and a large farming base.

8.7 There may be merits in importing biomass to augment UK production and to assist in making bio fuel production more competitive if imported material comes from sustainable sources with lower production costs and carbon saved is not outweighed by transport costs. For example, currently some bioethanol imported into the EU has no import tariff applied.

Q9. *What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?*

9.1 UKPIA does not have specific expertise in this area but the Biomass Task Force report indicated, for example, a huge potential for the use of the 5–6 million tonnes of wood waste generated in the UK each year.

9.2 At some future point, once the technology is commercialised, woody wastes,straw and other cellulosic material could also be applied in the production of advanced bio fuels using enzyme type technology (bioethanol) or partial oxidation (diesel).

Q10. *What lessons can be learned from other countries' experience in the production and use of bioenergy?*

10.1 The Biomass Task Force Report highlights a number of areas where overseas experience could be applied in the UK, particularly with the use of biomass to produce heat and power, and makes a number of recommendations as to how such developments might be encouraged.

10.2 The oil industry is involved in research into a number of technologies to derive liquid fuels from waste products such as ethanol from straw and diesel from woody wastes using the Fischer-Tropsch process.

10.3 The oil industry has extensive experience in the supply of bio fuels for road transport in a number of countries. This expertise will be used to meet the targets set in the RTFO.

Thank you for the opportunity to contribute to this important debate.

UK Petroleum Industry Association (UKPIA)

February 2006

Memorandum submitted by the Society of Motor Manufacturers and Traders Limited (Bio 22)

1. The SMMT is the leading trade association for the UK automotive industry. SMMT provides expert advice and information to members as well as to external organisations. It represents some 600 member companies ranging from vehicle manufacturers, component and material suppliers to power train providers and design engineers. The motor industry is an important sector of the UK economy. It generates a manufacturing turnover approaching £45 billion and supports around 850,000 jobs.

2. SMMT welcomes the opportunity to contribute to the EFRA inquiry on bioenergy. The following comments focus on the role of biofuels in road transport.

Executive Summary

3. SMMT believes that biofuels have an important role to play as part of an "Integrated Approach" to reducing CO_2 emissions from road transport. The Integrated Approach combines improvements in vehicle efficiency with greater use of alternative, low carbon fuels, measures to avoid congestion and driver information and education (eco-driving). Established by the European CARS 21 initiative to achieve further car CO_2 reductions cost-effectively, the Integrated Approach is now being pursued under the European Climate Change Programme II.

4. Biofuels have the potential to reduce vehicle well-to-wheel emissions by up to 80%. Carbon savings and cost vary significantly between different fuel options, depending on feedstock, production and conversion process and use efficiency. Conventional biofuels, like ethanol from wheat, are capable of reducing WTW emissions between seven and 77% today. Second generation biofuels, expected to become available from 2010, promise to optimise these saving potentials even further.

5. All vehicles today are able to operate on 5% blends of biofuels in petrol and diesel, providing immediate CO_2 savings across the whole vehicle parc in an economical manner, which is due to the utilisation of existing vehicles and refuelling infrastructure. SMMT members are already bringing to market vehicles capable of operating on higher blends (eg FlexFuel Vehicles—E85). The industry is also working with the oil industry and other stakeholders on future European standards to enable the use of higher percentage biofuel blends in all new vehicles (10% blends—E10, B10).

6. SMMT welcomes the Government's ambition to incentivise the production and use of sustainable biofuels with optimised carbon savings as part of its Renewable Transport Fuels Obligation (RTFO). We support the development of sustainability standards and carbon certification for biofuels progressed under the auspices of the Low Carbon Vehicle Partnership. However, similar clear long-term signals should be sent to the market in respect to fuel quality. We urge the UK Government to ensure that biofuels which are incentivised through the UK fuel duty rebate and certificates under the RTFO strictly adhere to existing and future European and UK fuel quality standards.

Specific questions

Q1. *What is the real scope for biomass and bio-fuels to contribute to tackling climate change? What proportion of the UK's energy and transport fuel needs could they provide?*

7. SMMT believes that biofuels have an important role to play in tackling climate change and reducing CO_2 emissions from road transport. The CARS 21 final report estimates that biofuels could contribute between 20 and 30 Mt/year CO_2 emission savings across the EU, if the Community goals for biofuels use set in the EU Biofuels Directive 2003/30/EC (reference values: 2/5.75% of road fuel energy content by 2005/2010) were to be realised.

8. Today's vehicle parc can already operate on 5% blends of biodiesel and bioethanol (E5/B5). The universal availability of such low-blend biofuels would therefore bring immediate carbon saving benefits from road transport. Under the Renewable Transport Fuels Obligation (RTFO) the UK Government aims to achieve a 5% penetration of biofuels (by volume) in the UK market by 2010. HMG estimate this would save 1 Mt CO_2 per year and equates to taking one million cars off the road.

9. SMMT members have also started to market vehicles that are adapted to operate on higher-blend biofuels in the UK and other European markets. Flex fuel vehicles (FFVs), for example, are capable of running on up to 85% bioethanol thereby providing further carbon saving potential beyond the current 5% blending limit for petrol and diesel fuels for use in conventional vehicles.

The motor industry is in discussions with the oil industry and other stakeholders through the European Committee on Standardisation (CEN) to develop future European standards that enable the use of higher percentage biofuel blends in all new vehicles (10% blends—E10, B10).

10. SMMT believes that strict adherence to existing fuel quality standards is a critical factor in developing market confidence in biofuels for both low and high blends. If Government aims to increase the role of biofuels in substituting carbon transport fuels beyond 5% post-2010, then market confidence and high quality biofuels have to be encouraged now. We urge the UK Government to ensure that biofuels which are incentivised through the UK fuel duty rebate and certificates under the RTFO strictly adhere to existing and future European and UK fuel quality standards.

11. SMMT would like to note that in addition to the above factors the contribution of road transport biofuels to climate change abatement also critically depends on:

- the actual supply and use of biofuels in the UK as a reaction to global market developments as well as the incentive and regulatory structure emerging in the UK and EU;
- the actual carbon balance of biofuels produced and used in the UK which has been demonstrated to vary widely depending on feedstock, production and conversion process and use efficiency (see question 4);
- the development of advanced, second generation biofuels;

— the Government's future energy strategy and competing priorities for the best use of biomass within the EU. Whilst climate change abatement features most prominently in UK discussions on the use of biomass, the EU Biomass Action Plan clearly states security of supply and agricultural policy objectives as equal drivers for greater bioenergy production and use in Europe.

Q2. *How cost-effective are biomass and biofuels in comparison with other sources of renewable energy?*

Q3. *How do biofuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?*

12. Relating to questions 2 and 3 SMMT would like to offer a combined response.

13. When considering the cost effectiveness of biofuels and biomass the SMMT would bring to the attention of the committee the work of EUCAR, JRC and CONCAWE on a "Well-to-Wheels analysis of future automotive fuels and powertrains in the European context". The study attempts to:

— Establish in a transparent and objective manner, a consensual well-to-wheels energy use and GHG emissions assessment of a wide range of automotive fuels and powertrains relevant to Europe in 2010 and beyond.

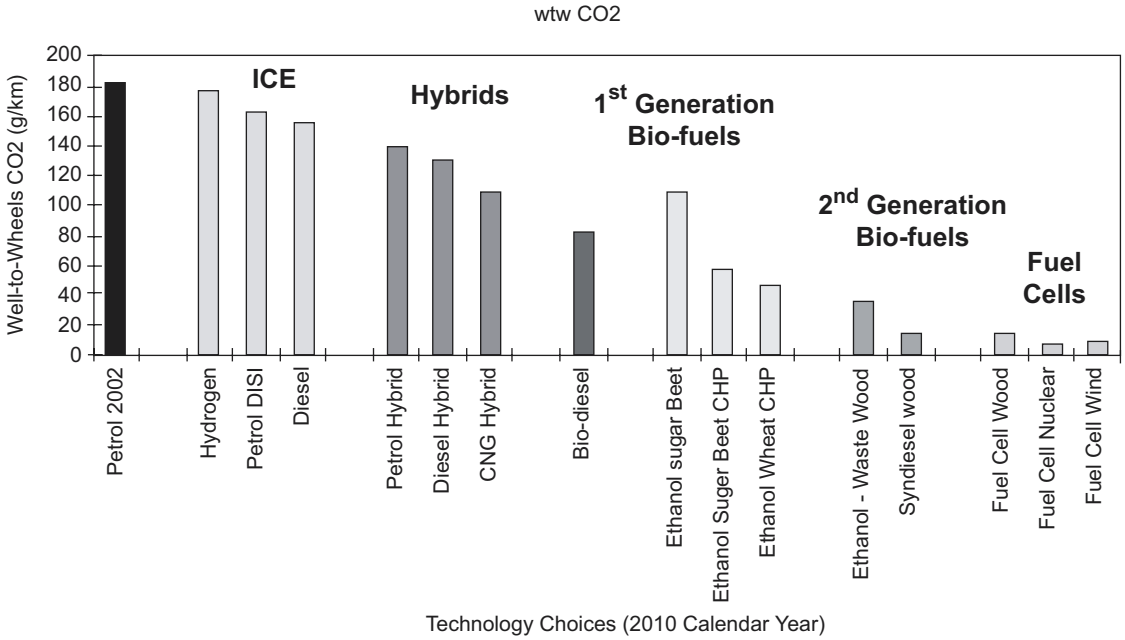
— Consider the viability of each fuel pathway and estimate the associated macro-economic costs.

— Have the outcome accepted as a reference by all relevant stakeholders.

14. For a full description of the study including assumptions, calculations and results, interested parties should consult the full set of reports and appendices available at http://ies.jrc.cec.eu.int/WTW

15. A sample slide (chart 1) from the study comparing Well-To-Wheel CO_2 Emissions (g/km) from Different Fuel/Powertrain Combinations: 2010+ is included for illustrative purposes below.

Fuel Effects on Car Transport CO_2
WTW CO_2 Emissions (g/km) from Different Fuel/Powertrain Combinations: 2010+



Source:EUCAR, CONCAWE, and EU JRC Data December 2005

Q4. *Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?*

16. SMMT welcomes the Government's ambition to incentivise the production and use of sustainable biofuels with optimised carbon savings as part of its Renewable Transport Fuels Obligation (RTFO). As the Well-to-Wheels study by JRC/CONCAWE/EUCAR (chart 1) demonstrates, carbon savings and cost vary significantly between different fuel options, depending on feedstock, production and conversion process and use efficiency.

17. SMMT fully supports the work on the development of a sustainability standard and a carbon calculation tool for biofuels, currently progressed under the auspices of the Low Carbon Vehicle Partnership. We welcome that these developments are now recognised at EU level by the adoption of sustainability and carbon balance objectives in the EU's Biomass Action Plan.

18. We believe that the reporting requirements envisaged under the RTFO's 2010 target are a realistic, intermediate step whilst work on a sustainability standard and common methodology for calculating greenhouse gas emissions from road transport fuels is being progressed, and the SMMT look forward to full sustainability and carbon certification in the future.

Q5. *What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and biofuels?*

19. The UK's RTFO target of 5% by 2010 and complementary fiscal incentives (fuel duty rebate, ECAs) send clear signals to the market about the Government's short to medium term goals for road transport fuel substitution through biofuels. The current Government consultation on the RTFO indicates that ambition levels beyond 5% are being considered post-2010.

20. Such a move would require a mandate for CEN to develop new fuel standards for higher blends in all new cars (10%, B10/E10). It would also require effective support for the development of higher blend niche applications, fuel infrastructure developments (eg through the EST infrastructure programme) and investment in second generation biofuels.

21. The market effect of these regulatory and fiscal signals, however, will critically depend on the credibility of the policy of biofuels substitution across Europe. The track record of increases in production and use of road transport biofuels in response to political targets has been less encouraging. Current ambition levels chosen by many member states are well below the reference values set by the European Commission and actual biofuel penetration rates are often lower than the targets aimed for by Governments.

Q6. *What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?*

22. Considering biofuels for road transport, the SMMT notes the current 20p per litre duty reduction. But, the current market share of biofuel sales in the UK (below 1% of total road transport fuels sales) indicates that this alone is insufficient to stimulate a significant market for biofuels. In Sweden, where alternative fuel vehicles are much more widespread, the duty discount is closer to 27p per litre.

23. Secondly, we note UK government activities on the RTFO and the EST low-carbon infrastructure grants programme—both measures are aimed at supporting increased used of renewable fuels. However, we must stress long term certainty is required by business in the sector if significant investments are to be made.

24. Current technical standards limit the use of biofuels in the majority of vehicles to 5% (E5 & B5). The UK Government could help promote the early adoption of higher blends of bio-fuels by encouraging the European Committee on Standardisation (CEN) to develop new fuel standards for 10% blends (E10 and B10).

25. The SMMT are concerned that only fuel of suitable quality should receive a duty incentive. We urge the UK Government to ensure that biofuels which are incentivised through the UK fuel duty rebate and certificates under the RTFO strictly adhere to existing and future European and UK fuel quality standards. The HMRC definition of biodiesel is inadequate, being based only on evidence that the fuel has been transesterified and not upon other "fit for purpose" parameters associated with good quality fuels. To be "fit for purpose", we believe that biodiesel should meet specification EN14214. Our preference would be that the HMRC criteria were themselves revised to require full EN14214 certification to gain a duty biodiesel reduction and. moreover, a renewable transport fuel certificate.

Q7. *What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?*

No comment.

Q8. *Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?*

No comment.

Q9. *What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?*

No comment.

Q10. *What lessons can be learned from other countries' experience in the production and use of bioenergy?*

26. Considering production of biofuels for transport, as shown by the EUCAR, JRC and CONCAWE "Well-to-Wheels" study discussed earlier and the work of the LowCVP relating to production of Ethanol from Wheat (www.lowcvp.org.uk), differing approaches and standards can result in markedly different greenhouse gas savings and environmental impact. Therefore, the SMMT would support the work relating to carbon balance and sustainability being carried out by the LowCVP and the DfT for inclusion in the RTFO.

27. Considering use and the promotion of the use of biofuels, the SMMT would suggest that significant institutional barriers and general inertia need to be overcome when moving down the path of bioenergy. Therefore, the bioenergy market needs stable and far-sighted financial support until it is of sufficient size to compete against non-renewable technologies. Such support should not only include traditional financial support, but also educational activities to allow the user to understand the climate change implications of their choices.

The Society of Motor Manufacturers and Traders Limited

February 2006

Witnesses: **Mr Chris Hunt**, Director General, **Mr Malcolm Watson**, Technical Director, UK Petroleum Industry Association (UKPIA), **Mr Simon Barnes,** Technical Manager (Environment) SMMT, **Mr Peter Stokes,** Volkswagen Group UK, and, **Mr Alex Bruce,** General Motors UK, SMMT, gave evidence.

Q118 Chairman: I apologise to our witnesses for having kept them waiting. We had a bit of internal business to transact which took us a bit longer and then the previous witnesses ran over the time limit. Could I formally welcome on behalf of the UK Petroleum Industry Association, Mr Chris Hunt, the Director General, and Mr Watson, their Technical Director. For the Society of Motor Manufacturers and Traders, may I welcome Mr Simon Barnes, Technical Manager of their environment section—so that has you nailed down!—Mr Stokes for Volkswagen and Mr Bruce for General Motors. You are all very welcome indeed. I am going to start by asking you the same question with which we have started off each one of these sessions: What is good and what is bad about the UK Government's approach towards the use of biofuels?

Mr Hunt: Firstly, I would start by saying that UKPIA fully supports a rational proportion of RTFO scheme as the best way of ensuring that the road transport sector makes its contribution towards the very ambitious 60% reduction in carbon by 2050 that our Government has set. We think that is a very positive move. Going for this form of obligation will take away some of the uncertainties for everyone engaged in production and use of biomass in that sector. But if I could say what I think is bad and perhaps missing, as you well know in our paper we did say that the objective of the use of biomass is the reduction of CO_2, and we noted in our work on future transport fuels both the report by the Royal Commission on the Environmental Pollution in 2004 and latterly Ben Gill's Biomass Task Force report expressing some dismay at the lack of progress, shall we say, towards other uses of biomass apart from road transport fuels. In fact, I can quote from Mr Gill's comments in the Task Force report: "The whole approach is characterised as no targets, no concerted policy, no strategy and limited support for development," which seems a shame when we have such an abjectly good resource that we use. On the other side, we would also cite in some of the work we did that while the motor vehicle manufacturers, the biomass industry and the oil industry obviously will make our contribution to this ambitious target we do feel that there needs to be a bit more emphasis on the demand side—i.e., there will need to be some changes in behaviour by consumers if we are going to get to that very ambitious target.

Q119 Chairman: Who is going to comment from the SMMT?

Mr Barnes: We are fully in support of the development of biofuels and very pleased to see the development of the RTFO in the UK giving clear direction in the UK of how we intend to move towards biofuel contents in our fuels. It has been talked about in the rest of Europe as part of that strategy. The industry believes that biofuels can make a significant contribution in the road transport sector to reductions in CO_2. We have heard the figure of a million tonnes of CO_2 reduction and we are very supportive of that. We do see biofuels in terms of an integrated approach, looking at the whole lifecycle of fuel and vehicle in terms of contribution to CO_2 as a way forward. We recognise the role that biofuels can play very significantly. Our slight concerns, I suppose, are ones of hoping this is a long term sustainable strategy throughout the whole of government, particularly from the point of view of some longer term indication on the duty and the fiscal environment in which biofuels will operate, where I think we are very useful and supportive. We

heard that again earlier today. We do see that need for that long term structure to enable the industry to move forward so that it can support and develop the technologies to make the best use of this newer fuel. The issue of security of supply in terms of the fuel is probably relevant and an acknowledgement within the transport sector that we are primarily reliant on fossil fuels at the moment, unlike the other sectors. Therefore, biofuels have a potential role and it is potentially a significant starting role in the ultimate move towards hydrogen. It is a very useful start down the process.

Q120 Chairman: I want to raise a point particularly with the PIA. Bluntly, you are at the liquid end of the market. In paragraph 1.7 of your evidence, there is a very interesting table in which the carbon dioxide reductions per hectare of land cultivated for a variety of biocrops indicate that the use of biofuels gives a poor return in terms of carbon dioxide saved compared with the use of biomass. I suppose I might say, if I was the government looking for an easy hit, I have an eight to one or seven or six to one ratio of saving of carbon. I might be more interested in encouraging the use of biomass than of biofuels. How do you respond to the findings of paragraph 1.7?
Mr Hunt: It is very indicative of the statement we have put out in our response. Firstly, we fully recognise that road transport has to take its part in the reduction of CO_2 and we are doing so through the RTFO. On the very simple sums, it is fairly clear that if you take biomass and use it for the generation of heat or displacing inefficient power generation, in CO_2 terms, you get a far bigger bang for your buck than transferring that all the way down the supply chain to biofuel. That is a fact.

Q121 Chairman: What does the SMMT think of that, because we are all getting terribly excited about the road transport fuel obligation and yet this table tells us we perhaps ought to be looking somewhere else?
Mr Barnes: We are in a learning process here in the development of these fuels, particularly with reference to second generation biofuels where we know that the yields can potentially be significantly higher. First generation plays a role towards second generation biofuels, so we acknowledge the difference. However, we would not want that to mean that the opportunity for the industry to move forward in fuel technology is taken away from it to some extent, if that is not too strong a way to put it.

Q122 Chairman: Is there a reason why we have not missed out stage one and gone to the second generation straight away, because if the returns are so much better why haven't we gone there now?
Mr Barnes: The cost of developing that technology is still largely unknown and there is still work to be done on that. We are talking really about 2010 being an important time period for when that technology may well come along. There will always be a role ongoing, we believe, for first generation within the mix and the strategy. We see this very much as part of a strategic move to looking at how fuels are used in the road transport sector, moving forward to 2010, 2015 and ultimately towards hydrogen.

Q123 Lynne Jones: Mr Hilton told us that, in terms of first generation fuel production, if you used waste agricultural products so you had part used for the biofuel and part for biomass, the implication was that would be as efficient as using the whole of the agricultural production for biomass. Would you care to comment on that and also what is the comparison between second generation biofuels and using the production just for heat and power?
Mr Barnes: On your first point, it seems logical if you are harvesting the grain that you then have the opportunity to use the straw in another way.

Q124 Lynne Jones: If you use the whole of it, so long as you are using both bits—
Mr Barnes: Exactly. We would fully recognise that would be a sensible thing to do.

Q125 Lynne Jones: But you would be for biomass production?
Mr Barnes: Yes. I understand what you are saying. Growing the right crop in the right context has to be the start of this process. Moving on to second generation biofuels, we are talking about potential yields being three or four times higher, if not more, than first generations. The use of the whole crop becomes much more pertinent in the biomass to liquid process and you have the opportunity to do that.
Lynne Jones: Would Mr Hunt care to comment?

Q126 Chairman: Mr Watson wants to volunteer.
Mr Watson: On the well-to-wheels basis that we have used, which is the equivalent of lifecycle analysis, we have looked at these options. If we take conventional wheat, we have the possibility of generating it using a variety of processes. There is a large energy demand in the process. If you meet that from burning straw, you get up to about 70/75% efficiency. If you take Brazil at the moment, they get up to about 85% efficiency. That is on a carbon saving basis. Those are both first generation processes and these would be the best examples. If you go to second generation processes, we are talking of 95%. You go that little further because you save a bit more carbon, which is the aim of this exercise. The second generation processes also give you a better yield per hectare so they have two advantages: more yield in terms of per hectare of land and also a bigger carbon saving, but they still do not quite manage the huge amount you get from power generation, as we have indicated in our paper.

Q127 Lynne Jones: It is a huge amount so why not just concentrate on the biomass, the power and heat?
Mr Watson: That is a choice for the government; it is not a choice for us.

Q128 James Duddridge: This is a question to the Petroleum Industry Association. In the evidence you refer to the oil industry as still being relatively low cost. Given the volatility of the main oil producing regions and pricing of environmental costs of use of carbon and so on, is it realistic to consider oil as low cost as far out as 2030 compared to other renewables?
Mr Hunt: On the studies that have been conducted—I refer to one particular study carried out by Concawe which is, if you like, an oil industry research body together with the European Union and the motor manufacturers—they have looked at a well-to-wheels basis on all the options. Without doubt, you find that whichever way you go in terms of absolute cost of CO_2 abated biofuels have a cost and will have a cost for a consumer compared to fossil fuels. Fossil fuels are available and they will be available well up to 2030 and beyond. They are manageable; people are used to them. The supply infrastructure is there. The refining infrastructure is there. Therefore, I guess it is the game in town to beat. On that strand, anything we do on a bio content in some way, shape or form will be a cost to society on a well-to-wheels basis. Having said that, that should not stop you from doing it, but we have to recognise that cost. Your second question was about security of supply, I believe, on fossil fuels versus other alternatives. Even if we took the last 30 years or more the very worst global crises we have had within the region and outside—particularly if we took the Iran/Iraq war, for example—the downturn in production from that for a fairly short time was 8%. Therefore, if we applied that to the current UK strategic stockholding obligation, if nothing else happened, those stocks would last the UK something like 36 months. The disruptions that have happened, if you look back at the actuality of the situation, have been fairly modest. Furthermore, if we took UK refining as an asset, something that we should use to give us the ability to flex and generate our road transport and other fuel needs from a variety of sources, there are probably something like 27 different sources of crude oil around the world. We compare that to where some of our biomass might be coming from. We probably have more options open on crude oil supply than on biomass necessarily.

Q129 James Duddridge: My analysis might be simple. Forgive me if it is and correct me. Demand over time, if we assume that that is static for energy usage and take almost fossil fuels and renewables as two products, if they are two competing products in a market economy, there will be a point as fossil fuels diminish in volume at which there is a cross over if you graph it out in terms of price, the renewables being better value for money. Have you a view on when that supply and demand graph date is projecting out?
Mr Hunt: On the supply perspective for fossil fuels, we are not going to run out. It is as simple as that. We have reserves now of conventional fossil fuels. There are heavy tar sands and various others that will eke us out well into the future.

Q130 James Duddridge: It is an absolutely limited resource so even if we are talking 200 or 2,000 years presumably there is a number of years?
Mr Hunt: At some point. I do not have a precise figure for that but it will certainly see me out. That is for sure.

Q131 James Duddridge: I was worried about beyond that and beyond everyone.
Mr Hunt: You are then looking at the development of the alternative fuels that are coming on behind which will be the use and application of things like hydrogen and where we generate that from renewable sources. The message was the imperative to move towards a lower carbon economy is not because you are going to run out of oil; it should be for the right, considered reasons going forward.

Q132 Chairman: Everybody keeps talking about hydrogen. Mr Barnes dropped it in as a little sweetener to his initial opening comments. How realistic is hydrogen transport? If I look towards our two motor manufacturers as part of your delegation, how far away are you from having a car available to the European customer that runs on hydrogen?
Mr Stokes: You have to acknowledge that there are two routes for hydrogen. One is in a conventional internal combustion engine and one is the much vaunted fuel cell. I think it is fair to say the fuel cell has been a perpetual 10 or 20 years away for as long as I can remember.

Q133 Chairman: It is a bit like the TB vaccine.
Mr Stokes: Exactly. That technology, depending on who you talk to, some people feel is further along the curve. Some people feel it is further back. It still seems to remain around the 20 year mark but an awful lot of work is going on there. In terms of the internal combustion engine, some manufacturers are looking at that and I believe there is a hydrogen filling point being set up in London somewhere so that a manufacturer can bring product in that will run on that. There are two developments but that is not renewable hydrogen; that is conventional hydrogen.

Q134 Chairman: How near are we to having a vehicle that can run on it? It is all right having a filling point but I do not think you will have very many customers in the United Kingdom because, unlike California, I have not been made aware that there is a fleet of cars knocking about. Maybe Mr Bruce is going to shock us and tell us there are some.
Mr Bruce: We do already have vehicles available running on fuel cells. The issue is more in relation to the range of the vehicle, the durability of the fuel cell and the cost of producing the fuel cell on a commercial basis.

Q135 Chairman: You are saying that hydrogen at the moment is more likely to be a fuel cell alternative than using hydrogen as a feedstock directly as a point of combustion, for argument's sake?

Mr Bruce: Different companies are pursuing both options. From General Motors' perspective, we are investing heavily in fuel cell technology specifically and looking to try and address those specific issues related to the cost of production of the fuel cell on a commercial basis, the range and storage of the hydrogen on board the vehicle. Those are the main issues that need to be addressed in order to make it commercial.

Q136 Chairman: To put what we are doing into perspective, our previous two witnesses made it very clear that if a biofuels industry was to become viable they would have to have an element of certainty with reference to the investments that would have to be made. What kind of a timescale—I appreciate you cannot be exact to any one year—are we talking about? Are we talking 5, 10, 15 years? You said it is always 10 years away but in terms of hydrogen powered vehicles is it always that speck of light away in the distance so we do not need to worry about it or is it getting nearer so that we can say, "Yes, we could well see some vehicles for sale in, say, 10 years' time"?
Mr Bruce: You could well see vehicles in that time frame but whether they will be affordable for everybody is going to be the big question. That is the fundamental issue in relation to hydrogen fuel cells, being able to produce them for the mass market on a commercially viable scale. That is really what we are grappling with in relation to fuel cells. For the foreseeable future, 10 or 15 years, you will see continued demand for biofuels both first and second generation.

Q137 Mr Williams: If the RTFO target of 5% by volume of inclusion of biofuels was achieved by 2010 it would be equivalent to a reduction of one million tonnes of carbon dioxide or taking a million cars off the road, but as the inclusion rate at the moment is only 0.3% do you think it is going to be in any way achievable?
Mr Hunt: UKPIA and its members are and will be committed by our government by an obligation to move towards that, from the work that we have been doing as UKPIA, the involvement we have in the RTFO committees, working with biofuel producers. For example, the indicative figures that we are hearing in those meetings, if we took biodiesel as an example, are that something like a 3% availability of total UK demand in 2008–09, rising to 4% in 2010. For ethanol you have sources like Brazil outside of the country. From a UKPIA point of view, what we need to make fairly substantial investments in bringing these fuels to market, always being very mindful of the imperative for quality and maintaining that quality—I am sure my colleagues in the vehicle industry will back me up on that—is a workable scheme and a well thought through process. Biodiesel will probably be easier to bring to market but we still need investment in tanks and necessary equipment at refineries and other points to do that. Ethanol is somewhat of a different animal. That will require a far more significant investment because you can only effectively blend that product in with standard petrol at the terminal, very near to the consumer. You need investment in tankage, blending equipment et cetera at those terminals and further down the chain there are issue in terms of the service station itself. Ethanol does pick up water. It tends to pick up dirt as well and the experience in Germany has said we have a fair bit of work to do to ensure that the service station is geared for receipt of that product. That gives us some things to think about over time. Of the 10,000 service stations in the UK, oil companies own and operate about 2,500. There are 5,000 independent service stations that need help in getting towards that so the investment cycle for ethanol is going to be longer than that for biodiesel which is why we have said in our responses to the Treasury in particular that the interim target should be set as achievable. Otherwise, the consumer will be paying a penalty for a CO_2 reduction which is not being made.

Q138 Mr Williams: Are you saying as the rate of inclusion increases so the investment by retailers at the petrol pump in the higher quality storage and distribution will increase?
Mr Hunt: No. What I am saying is it is the speed at which you can make the investment. For example, if you take the investment we need to do on ethanol at major terminals around the UK, you can imagine the sorts of discussions we are going to have on planning permission following Buncefield, about putting in additional tankage for highly volatile products. It is a question of availability of the product and the infrastructure to take it. They are the only limiting factors really. It is not a lack of will.

Q139 Mr Williams: Would the motor manufacturers like to comment on whether the target will be reached or not by 2010?
Mr Barnes: Last year we had 0.3% of biofuels content in the UK. We are manufacturing cars now to a 5% standard, so towards 5% that is not an issue. The car parc today can run on that percentage of fuels. Going beyond 5%, we certainly need the European CEN standard on fuel to be established as soon as possible to enable us to start manufacturing towards that higher percentage. The introduction beyond 5% also raises some slightly different issues at the point of dispensing and potentially with informing the public that there will be vehicles that will run on 5% and on 10%. Up to 5%, fine, but beyond that needs further consideration.

Q140 Mr Williams: Stephen Ladyman, the Transport Minister, said recently that after 2010 it should go well above the 5% inclusion rate. Are you saying that the current fleet of vehicles, some of which will be still on the road by 2010, could have real difficulties?
Mr Barnes: Indeed. The average car survives for 12 or 13 years so yes, inevitably not everything will have worked through the car parc. That is a practical issue.

Q141 Mr Williams: How could that be addressed? By one pump having 5% inclusion and one having 10%?

Mr Hunt: In practical terms, in terms of a fuel infrastructure in the UK or anywhere else across Europe, as you would appreciate—I will use the UK as an example—48 billion litres of product and 140 million litres per day are going out to some four million customers. That is going out through 1,500 miles of pipeline, 70 terminals, 10,000 service stations. If we are to move that infrastructure which is a high volume but extremely low margin infrastructure, it tends to have to move at once, together, because of the way it interrelates and works. Therefore, at the moment, 5% is written into the standards. That is the law that oil companies will abide by, set by CEN in Europe with due consideration to everything. I know that CEN have under consideration very urgently whether that should move further towards ten, but it needs to happen consistently because we will not have that flex within the infrastructure to have some pumps with 10% and some with five.

Mr Williams: I am still very worried about a range of cars some of which are able to accommodate 5% and some of which could accommodate a higher percentage. How are we going to encourage motorists to use the higher percentage?

Q142 Mr Drew: When we went to Brazil, Brazil made this happen. They did not say, "If it goes to 6% the government is going to collapse and we are going to be attacked by the manufacturers and the petrol companies." They just laid it down and it has happened so why can we not make this happen in the UK?

Mr Bruce: The normal standard for blending in Brazil is 20% so all vehicles are equipped to run on 20%. It is an issue of the standard that is in place in the specific market that you are talking about. There was already an established standard for that and also a local market which was well catered to production of bioethanol on a very large scale. Those factors have come together. In terms of the question you were asking about how do we get the consumer to choose the higher blend, you have to give a consistent signal, we believe, through fuel duty. That is why we are concerned that there should be a long term signal to the consumer by that means. There are a number of other levers open to industry. Our experience, speaking for Saab in Sweden, has been that by taking a strategic and integrated approach, looking at all of the levers that are open to government, whether through company car tax, through vehicle registration tax or fuel duty, they have really stimulated the market there by looking at a package of measures. That is what we feel is missing here in the UK.

Mr Stokes: We have had a similar issue in the past which could probably serve to illustrate what can be done in these situations. As diesel became more widely sold in the UK, we had an inordinate number of people who were misfuelling. They had previously owned a petrol car and, without thinking, they pulled up next to the petrol pump, filled it with petrol and then had all the issues that went along with that. You may recall that one of the ways that was addressed was manufacturers advertising on television that it was a model and a diesel: "Do not forget it is a diesel." There are also notices inside the petrol flaps and reminders of this nature as well, so it is an education thing to be able to say, "Do not go to the wrong pump."

Q143 Chairman: Here we are, fiddling about with 5% and you are saying we have to do some investment in the engine, this that and the other. You guys have seen this coming for ages. This is not a brand new subject. What are the great technological barriers to stop you going from five to 10%? What do you have to do to your Volkswagen diesel engine to make it run on 10%?

Mr Stokes: The first thing we have to do is to make sure that the standard of fuel that we are putting in is absolutely consistent because it is not going to be the oil company where the guy filled up last that is going to come under difficulty should the vehicle fail. It will be the manufacturer of the vehicle that will pick up those difficulties. Most manufacturers have said, "We are prepared quite quickly to move to 10% provided we have a solid standard" and we are encouraging CEN to come up with that standard.

Q144 James Duddridge: If there is going to be a step change to a solid standard and you have to have consistency across fuel, is there an argument for saying 10% is far too modest; let us go for a much greater gain? What would be the resistance to doing that if there is a big, one off hit of changing cars, giving us a separate pump and going through the education process? Are we being far too modest?

Mr Stokes: There is possibly that point. I am not expert enough to say where that point is, whether it is 30% or 50%. If it is 50%, we are at a point where we cannot supply enough biocontent to reach 50% so it is not worth the effort of getting to that point.

Q145 James Duddridge: Is the answer, if it is a big step and we need to do more probing, we should go for the absolute maximum percentage that can be supplied by biofuel?

Mr Barnes: What would be useful would be probably a global discussion and a global standard on this issue. We are producing cars for sale throughout the world which are using technologies throughout the world, so that might be a helpful place to start on this discussion.

Q146 Mr Rogerson: On that very point, in the US warranties are honoured up to 10%. Why 5% here? What is different?

Mr Barnes: The US has a clear standard for 10% fuels and the European standard is only 5%. We know that vehicles are being manufactured in the UK and exported to the US to run on a 10% standard. There is no barrier to the technology. We can produce cars that run on that. We produce them in the UK now. It is just a clarification of what the standard is going to be.

Q147 Chairman: If I have understood you correctly, you use the term "the existing car parc" and I can understand that for most modern cars you do not have to worry about them running on 5% biodiesel or an equivalent percentage of bioethanol. There is not a technical problem. You do not go 0.1% over the number and the engine goes bang. That is the main message I am getting. The second message I am getting is that if we want to go beyond the current target it is the certainty that the fuel will be according to an agreed specification consistently, without some of the problems that Mr Hunt was alluding to, that would then give you confidence to say, "Our cars will now run on the entire thing." If you go to, say, 10, 15 or 20, are there any technological changes that you have to make to the current types of internal combustion engine to enable them to run on percentages above 5%?
Mr Barnes: Different fuels have different characteristics and therefore some of the equipment, some of the lines, for example, in the ethanol engine have to be changed to be more tolerant of the higher ethanol content and its different characteristics. In terms of a diesel engine, you are talking about changes to the injector system and changes to the engine management system to ensure that we are able still to achieve the emission and air quality standards that are set through the regulatory system. Yes, there are bits of kit that have to be changed. The engine management system needs attention to ensure that we maintain our regulatory commitment to air quality standards.

Q148 Chairman: From the car buying public's point of view, would I be right in assuming that you would argue you can only move as quickly as the velocity of circulation in the car parc of new for old?
Mr Barnes: We think that potentially gives the biggest benefit and we think that can work. We know that certain manufacturers are producing what they call flexi-fuel vehicles which will run on E85 but in terms of the greatest CO_2 contribution introduction into the total car parc through strategic means has to be the way to go. It gives the biggest tonnes of CO_2 saving.

Q149 Chairman: What about the commercial field, trucks and buses?
Mr Barnes: There is a discussion there. Because they bunker at individual sites and they fill up at depots, there is more of an opportunity to do biofuel quicker and we have seen that in other European countries, where bus fleets are designed to run on biofuel supplies at an earlier opportunity. Yes, I think there is that discussion in terms of the bus market. For HGVs, it is probably less so but potentially in terms of passenger buses, for example.

Q150 Mr Drew: Can we look at the issue of land use? We are fairly clear that if you take it to an extreme you could turn the whole of the land mass of the United Kingdom and more over to biomass, which is not necessarily likely, but I know UKPIA have made a comment in their submission about the practical advantages of having a high component of biomass. Yet, at the moment, we are using biofuels for transport entirely. How do you try and square this circle?
Mr Hunt: In terms of the use of the land mass, there are some very clear options. UKPIA unfortunately, not being the elected body that government is, can merely point out what those options are and the benefits of those options. We cannot make that decision. We are fully behind the RTFO which will give 5% by volume by 2010 of biofuel in road transport. From the figures that we have seen coming from Ben Gill's report and the RCEP, there are something like between one and two million hectares available without severely disrupting food production or biodiversity. That does equate fairly well to a figure of 5% or moderately above of UK road fuels into bioproduction. You still have these options. Do we need to do more? I talk about the UK now. Do we need to do more in considering the other optional uses for biomass, which are power and heat effectively?

Q151 Chairman: We are still struggling in the transport sector to stem the tide of rising emissions. Here we are, talking about relatively small rates of inclusion of biofuels. If you were giving advice to the government as to how to play catch-up, what would you say to them?
Mr Hunt: The figures that UKPIA produce and the DTI figures on emissions from road transport are that they are fairly stable. If we look at the measures taken by the vehicle manufacturers, together with the fuels that we are about to supply of low sulphur in the UK and across Europe, there will be efficiency and other gains which will reduce that further. It is transport with a capital T. It is inclusive of aviation. Road transport *per se* is not in a position where it is onwards ever upwards, despite the fact that miles driven every year increase. The combination of vehicle efficiency against that counteracts it.
Mr Barnes: The amount of CO_2 from road transport is a function of the fuel, the vehicle technology, the driving style and the distance you drive. We have seen a decoupling of the growth in emissions from road transport versus the economic growth. One reason for that is the improvement in vehicle technology. We have seen over a 10% reduction in CO_2 for new cars since the start of the so-called voluntary agreement which, as we know, is moving forward. We believe that this needs an integrated approach to all of those functions: how you drive the car, the fuel you put in it and the type of car you buy. Educating and engaging consumers in this debate is extremely important. We are learning a lot about that and we know that the Department for Transport are doing a lot of work on how there is a selective requirement to engage consumers in this very important issue, to do things that appeal to them and close the so-called attitude action gap of, "I say I am going to do it but, in the end, I do not."

Q152 Chairman: Mr Hunt, could I ask for your observations on an important point made by our previous witnesses and in evidence to us about this

question of the 30 pence a litre buy-out price? What is the Petroleum Industry Association's reaction to that proposal?

Mr Hunt: We do not have a formal position on buy-out. We have expressed some view to the Treasury but buy out meaning the combination package of between duty and a buy-out price of around 30 pence would appear to be adequate for the first stage.

Q153 David Lepper: David Drew talked about the situation in Brazil. We mentioned flexi-fuel vehicles. The figures I have seen suggest that something like 90% of the Focus vehicles being produced by Ford are sold in Sweden. It is suggested that in Brazil something like 80% of new car sales this year are going to be flexi-fuel vehicles. Are all the companies involved in producing flexi-fuel vehicles? It is not just Ford?

Mr Barnes: Not all companies are involved in flex fuel vehicles, certainly in a European context. Saab as part of General Motors and Ford are leading the way on those particular products in those two specific brands. In Sweden, there are considerable additional incentives, not only on the duty side but the company car tax side, to encourage people to buy flexible vehicles and there is the amenity value of parking benefits et cetera to encourage that. Sweden is amiable for its strategy of going down this road. We do see manufacturers taking different routes for different technologies and we would support a technology neutral approach that considers and allows different manufacturers to take different routes towards a lower carbon road transport system.

Chairman: Gentlemen, thank you very much indeed. You have given us a lot of food for thought. We are grateful to you also for the effort you put in with your written evidence. There was a great deal of very helpful information in there. If, after this session, there is anything else you think you would like to communicate to us about this subject we will always be happy to have some additional written material to look at. Thank you very much for coming before the Committee.

Supplementary memorandum submitted by UK Petroleum Industry Association (UKPIA) (Bio 25a)

UKPIA wish to put on record a rebuttal of what Mr Hilton said about UKPIA in answer to Q89 of his evidence. He referred to the fact that UKPIA saw the subject of carbon accreditation as an opportunity to delay the introduction of biofuels. This is not true and whilst not rebutted in our evidence that followed, we wish to make clear to the Committee that UKPIA has stated publicly that accreditation should not be used as a delay mechanism. Indeed UKPIA is active within Low CVP in helping to establish a carbon balance and sustainability scheme.

UK Petroleum Industry Association (UKPIA)

March 2006

Memorandum submitted by Volkswagen (Bio 32)

We recently had the privilege of giving evidence to you and the EFRA Committee regarding the "Role of Bioenergy", in particular relating to road transport.

Whilst the questioning was robust and challenging, we felt that it left some areas of the discussion only partially explored or substantiated and would therefore like to clarify and elaborate on a few points with this post evidence session submission.

Our main concern was that, whilst second generation biofuels were touched upon during the session, we did not feel the implications were fully realised and would like to enlarge on the key points.

1. We would like to begin with the obvious statement that the greatest CO_2 benefit to the environment from using biofuels or other CO_2 reduction technology is accrued when the largest numbers of vehicles in the vehicle fleet are using them.

By way of example, hybrid petrol/electric vehicles have been available in the UK market for some years now and have gained limited market penetration and therefore limited benefit to UK CO_2 reductions. In the same timeframe, our FSI (Fuel Stratified Injection) direct injection petrol engine has become the standard engine in ALL of our petrol engined vehicles across our whole model range. Conservatively, we estimate this technology has a 5% fuel and CO_2 saving over conventional petrol engines. We have sold over 400,000 FSI models in the same period that hybrid vehicles have been on sale. Without delving into a statistical analysis, a 5% [PS1] CO_2 saving over 400,000 vehicles must be far greater than that of a very limited number vehicles with lower CO_2 emissions. This point does not diminish the necessity for vehicle manufacturers to drive towards bringing to market low CO_2 vehicles but is merely used as an example to illustrate that smaller benefits over larger volumes can outweigh larger benefits on very small volumes.

As was pointed out during the evidence session, it takes time for the UK Fleet to renew, and therefore, the larger the number of new vehicles with a CO_2 benefit sold in any year, the faster that benefit will permeate through the Fleet as it ages.

In line with our belief of small saving over large volumes, we believe that the use of 5% biomass (in petrol and diesel) should become the standard fuel offering available on forecourts in the UK, and welcome the Renewable Transport Fuels Obligation as a mechanism to deliver this.

2. In line with Point 1, we also believe that biofuels which do not require wholesale infrastructure changes (ie fuel transportation equipment, delivery infrastructure etc) are environmentally and economically more beneficial and therefore more likely to gain mass market acceptance.

We see little sense in pushing for very strong blends of biofuels which require a separate fuel infrastructure etc and are not compatible with the existing vehicle Fleet, as is the case with, for example, E85 Bioethanol. Very strong blends require special vehicles, which will inevitably sell in small numbers and take a longer time to have a significant impact on the Fleet.

Therefore, we believe the focus should be less on introducing very strong blends, but rather on creating a fuel standard that goes beyond the 5% blend, and has a high level of compatibility with a large part of the existing vehicle Fleet. A 10% blend has been mooted and this seems entirely sensible.

3. Regarding second generation biofuels, Lynne Jones MP, correctly observed that harvested wheat could be used as a road fuel and the rest of the plant used as biomass for other purposes and that this was a good way of maximising the energy yield per hectare. However there are a number of points which need elaborating.

Second generation crops differ dramatically from first generation ones.

With first generation, the crop (the Wheat itself or the Rape seed) is the important target and therefore a plant (perhaps genetically modified, as has been suggested) which is extremely small but has a large crop is the ideal feedstock.

Second generation (Biomass to Liquids or BtL) fuels are less dependant on crop but more dependant on overall plant mass. Therefore the ideal second generation fuel feedstock is one which is extremely leafy, large and fast growing, since the whole plant is used and not just the crop. Additionally biomass wastes can also be used as a feedstock to the process.

To illustrate the impact that this has we offer the following observation.

At a recent biofuels conference organised by the Low Carbon Vehicle Partnership ("The Use of Biofuels in Transport", 28 February 2006), a presenter from the farming community spoke in terms of generating three tons per hectare (t/ha) of Rapeseed biomass per annum as normal practice, and a peak of five t/ha as good practice. Second generation feedstock yield is conservatively talked about in terms of 15 t/ha. In addition, as pointed out by UKPIA the process of generating second generation fuel from feedstock is more efficient than that used for first generation.

Put simply, the same amount of land used for first generation biofuel can yield more second generation fuel, and the biomass grown is more efficiently turned into fuel.

This is not however the whole story. Second generation (Biomass to Liquids or BtL) biofuels lend themselves very well to producing a high quality diesel fuel. The implications of this are quite profound.

Firstly, the diesel produced will be completely compatible with the existing diesel fleet and does not require a new fuel delivery infrastructure or specially designed vehicles. It can be used in any blend from 5% to 100%.

Secondly, the fuel has no contaminants, which means that the existing diesel vehicle fleet will produce less regulated exhaust emissions (those linked to local air quality issues), just by changing the fuel.

Thirdly, diesel engines remain the most efficient powerplants for vehicles, and therefore use less fuel and produce less CO_2 than their petrol or ethanol counterparts.

For example, it is generally accepted that a diesel engine is more efficient than its petrol equivalent. What is not often mentioned is that in terms of miles per gallon, an E85 vehicle is less efficient than the equivalent petrol vehicle (since bioethanol contains less energy, the stronger the blend, the more you need to use to cover the same distance). Ideally we should seek to make maximum use of the fuel we have grown or more land will need to be used for fuel production.

Put simply, a diesel engine could be up to 20% more volume efficient than its E85 counterpart. That means it requires up to 20% less BtL diesel to cover the same distance and since tailpipe CO_2 is linked to consumption, we can expect this to be similarly reduced. For maximum future benefit, the Fleet should be encouraged to take up clean diesels, exactly the opposite to what Government policy is doing today.

A variant of second generation fuels will allow further developments to the internal combustion engine, combining the best features of both petrol and diesel engines. This holds out the prospect of far more efficient engines than those we have today.

Fourthly, during the hearing we touched on fuel cell vehicles and hydrogen. The production of renewable hydrogen is key to fuel cell vehicles reaching their CO_2 reduction potential on a well-to-wheels basis. The production process for second generation biofuels lends itself well to using its existing feedstocks and processes to produce renewable hydrogen. Therefore, by creating second generation biofuel farming practices, farming community and production processes, we will have by default created the infrastructure for renewable hydrogen.

We hope our comments have created the same enthusiasm in you that we have for the potential of second generation biofuels. It would be right to say that to achieve this will not be easy and is beyond the scope of a single vehicle manufacturer, fuel company or member state.

Facilitating the move to second generation fuels requires government policies which encourage investment in research and work with industry to provide the right incentives and signals. At this point we must be acutely aware that policies which "lock in" first generation fuels and inhibit the introduction of second generation fuels must be avoided.

In recognition of this, on 7 March 2006, the Alliance for Synthetic Fuels in Europe (ASFE) was officially launched in Brussels and endorsed amongst others by:

Gunter Verheugen, Vice President of the European Commission, Commissioner for Enterprise and Industry.

Josef Proll, Austrian Minister for Agriculture, Forestry, Environment and Water Management.

Anders Piebalgs, European Commissioner for Energy.

Sadly, there was no representation from the United Kingdom.

The Alliance has as its current members, Daimler Chrysler, Renault, Volkswagen AG, Shell and Sasol Chevron.

Our objectives can be summed up as working together to create the right conditions, technical, political and economic, for the promise of second generation biofuels to be realised.

We hope this letter has been of interest, and are available to you and the committee to expand on this topic further. We enclose promotional material from the launch of the ASFE and a brochure on Sunfuel(R) for your perusal.

Further information can be found at www.sunfuel.de

Volkswagen

May 2006

Wednesday 19 April 2006

Members present:

Mr Michael Jack, in the Chair

Mr David Drew
James Duddridge
Patrick Hall
Lynne Jones
David Lepper
Mrs Madeleine Moon
Mr Dan Rogerson
David Taylor
Mr Roger Williams

Witnesses: **Sir Ben Gill**, leader of the Biomass Task Force, and **Mr David Clayton**, secretary to the Biomass Task Force, gave evidence.

Q154 Chairman: Good afternoon, ladies and gentlemen. Can I welcome formally, in a new starring role before the Committee, Sir Ben Gill in his position as the leader of the Biomass Task Force? Ben, I am delighted to see that you are wearing a pink shirt and a pink tie. I now understand clearly why you have done this, because I notice from the photograph in the Biomass Task Force Report that you are wearing exactly the same tie and shirt, and this was clearly done so that we would not forget who you were! It is clear that the shirt and tie have stood the test of time. You and David Clayton, the secretary to the Biomass Task Force, are both welcome. Can I start by passing an observation on the report, which I have had a look at. The thing that particularly caught my eye was in the appendices, page 66 of the report, in which you describe the multiplicity of grant schemes and programmes which various people have over time initiated in an attempt to get biomass, biofuels off the ground. It struck me that the whole area is a bit of a mess. There are lots of little bits going on. There is a lack of coordination, a lack of clear strategic objectives. Would that be a fair summary of what you found?
Sir Ben Gill: Thank you, Chairman, for the invitation to come. The significance of the pink shirt is twofold: first, to show sustainability and reusability and, second, to indicate the emphasis of the closest I have got to something red which indicates an association with heat and the ignorance that pervades on heat, and I have to reinforce that point. I think you have very succinctly put your finger on the key element of all that came out of our work: the lack of coordination, the lack of understanding, and, when I do presentations I use one word, "ignorance"—ignorance not to be confused with ignorant, the pejorative meaning of it, but ignorance (which in the OED means lack of knowledge or awareness) about where we are in regard to all these issues. Irrespective of all these grants, which confuse people as to what they should apply for, some are switched on, some are switched off, some come from different bodies that will interlink and some do not, there is a confusion of advice, which is quite frightening, and there is confusion amongst the experts in the industry. If I can illustrate with one simple example, shortly after we completed our report a city institution that was sponsoring one of the new city academies approached me because they wanted to put a biomass boiler in to heat the new city academy but had been somewhat frightened off by the contractor, who said, "If you want to do that, the initial cost of a biomass boiler will be £170,000 more than a gas one". As big as the city institution was, they felt that was a little excessive and they asked me to look into it. When I did the research I found that the actual additional cost for a biomass boiler as compared to gas was not £170,000—the contractor was quoting £155,000 too much—it should have been £15,000. I understand what had happened was common place, where the contractor thought, "I do not understand this but I am not going to tell my client this", passed it to a consultant who said, "I will sort it", but did not understand it, passed it to another consultant who again did not understand it and at each stage 100% contingency was put in place to wrap the figure up. This ignorance, which is pervasive, about what is happening in biomass, what is happening in renewables, is comparative and fits into the point you have made about the plethora of avenues down which to go where there is no single approach. The single message coming from the various parts of government, which is another point in itself, we see clear emphasis of importance, and I do not mean you to take this that I am trying to be particularly inclining one way or another, but Defra actually are seeking to do something about biomass, but you might as well bang your head against a brick wall with some of the other government departments. We see the Prime Minister is talking about trying to join things up, but their ability to join things up, their desire to do so, is woefully lacking and is in urgent need of someone to knock their heads together and make them realise the practical consequences of what they are doing and the solutions that they are missing.

Q155 Chairman: Have you seen in the Climate Change Programme Assessment, which has just been published, any evidence that the Government has understood the line of observations that you have just put before the Committee?
Sir Ben Gill: The aspect of communications is one, I think, that certainly has been picked up and commented on in the communications of the Climate Change Review, but, unless there is a willingness in the key government departments, and particularly by officials, to recognise that, then the Government can say all it wants about wanting to

communicate but the actual practical delivery is impaired by a lack of willingness to do this. If you look, the Climate Change Review is proposing to have a capital grants scheme for biomass. That is going to be funded totally by Defra. Where is the DTI money? As we make the comment in the report, given the three elements of renewable energy—electricity, road transport and heat—heat is the bigger fraction of those three and yet has gone unaccounted, lamentably so, over the years. While we have talked about renewable obligations for electricity and we have talked about renewable transport fuel obligations, we have done virtually nothing about heat. The most ridiculous fact, I think, that has really got to be addressed is that in the fifties we built a system of electricity generation in this country which was right at the time but today wastes enough heat to heat the whole country for free. If we are serious about energy efficiency and saving energy—and there has been some talk about it in the media this weekend just passed—then, instead of rebuilding a similar number of mega gas powered stations—coal, clean coal or nuclear—nuclear does not produce the heat, but in terms of coal or gas or biomass, we should build many more smaller localised ones, as has been exemplified works effectively by Woking Council, for one, who I think have set the example.

Q156 Chairman: Do you get the impression that the Energy Review is going to give any comfort to your line of thinking?
Sir Ben Gill: I am more focused in the short-term on the response that will come from Government to the Biomass Task Force Report next week. The indications are that the vast majority of the recommendations we have made will be agreed to. I cannot give that as cast-iron, obviously, until the report comes out, but the indications are positive that they have picked up on this, but again it comes down to across government implementation and picking up on exemplars, where there are exemplars, of best practice.
Chairman: Thank you very much for those introductory observations.

Q157 David Taylor: It was an interesting anecdote with which Sir Ben started his evidence, but I am not totally surprised. I am not quite sure whether it is the lack of joined-upness behind what you described or whether it is the approach of the city technology colleges who are getting a rather startlingly good deal and want to capitalise on that. In the county of Leicestershire there is a project based on the heating of public buildings from wood pellets. I do not want to step on the toes of later questioning, Chairman, but the problem that there seems to be in the biomass systems of this kind is in the incentives to have innovative generation technology and also to develop supply chains. In the Government scheme to support biomass, they have announced that they are going to give £10–15 million over the next two years as part of a five-year commitment. I would have thought that that later period is not sufficient to stimulate much extra interest—it is not a long enough period—and the amount seemed rather small. What is your attitude to that? It is your recommendation they are responding to.
Sir Ben Gill: What you have done is raised one other point in my mind when you mentioned the colleges. There is also a potential simple clash of basic government organisation, in that very often the capital fund comes from one pocket and the revenue expenditure comes from another pocket, and so, if you have to spend more on capital to save revenue, they are not bothered.

Q158 David Taylor: Exactly.
Sir Ben Gill: This is a major anomaly. You can have a pay back on that capital spend in a very short time, but, because it requires additional capital, no recognition of that pay back is given. In Leicestershire—

Q159 David Taylor: You need not relate it specifically to Leicestershire, but there is a general point. Is this a long enough period over which to allow them to provide an incentive and are the amounts on offer anywhere near enough to generate interest in new generation technology?
Sir Ben Gill: We spent a lot of time looking and trying to project how things would go, and during the period of the study, which was 12 months from October 2004 to 2005, the dynamics of the energy market changed quite dramatically. We were just reflecting on it as we were waiting to come in. Over the period when we started the study oil prices were down and had been down in the mid $20. What that meant was that economic dynamics were very different. Oil was trading at 25, 30, 35 dollars per barrel. What has happened, with oil prices going up remorselessly and this week touching around $72.80, I think, the rate it is currently at, that has altered the dynamics factors with gas prices following as well. When we started the study heat would have a realistic value of about a penny halfpenny per kilowatt hour. By the time we were finishing the study heat was already valued, particularly in off gas grids, at about four pence per kilowatt hour. If you factor that into the situation with regard to heat alone, boilers, or if we are to take heat as part of combined heat and power, what we determined was that the revenue economics were actually revenue positive. What was wrong was that there was a big up-front capital burden of the type I have mentioned that needed addressing, and people were concerned that even if the revenue position may be cash positive at the moment, there was a lot of talk six months ago that oil prices are going to come back down again. Indeed, we saw some studies that have been submitted to Government that suggested that oil prices could be back down to $30 to $40. That is something I do not believe will happen, but that was in people's minds, and when you are investing in a boiler that is going to last for 20 years you will take that into account. That was the justification, therefore, for having an up-front capital grant system that kick-started and energised the position to get people into the position of used to biomass boilers, whatever the market says, and that actually

served another function. It creates scale in the manufacturing capacity for boilers in this country and there were indications from boiler manufacturers that we talked to that, once that scale had built, the capital cost in itself would fall negating the future needs of the capital grant. We said two things further that you have not referred to: (1) we said not that the Capital Grant Scheme should end at year five, but we proposed that it should be reviewed at the end of year four to determine what the economics of the systems were at that stage, and, given the dramatic changes that have happened in the last 18 months, we felt that was prudent to ascertain because we thought, if the economics had changed, it may no longer be justified; and (2) we said that in the meantime the Government should give urgent consideration to what mechanism should be put in place to give fair compensation for the carbon saved by the use of biomass heating systems in a simple and effective manner.

Q160 David Taylor: One brief and final point which ends my section, Chairman. The Renewable Energy Association—and I know you will recognise this quote—told us, and they will have said similar things to you, that the Bioenergy Capital Grant Scheme has "failed to contribute either to the advancement of biomass generation technology or the development of a biomass supply chain". Both of those areas are things that concern me because of local examples particularly. Do you agree with that observation? It would suggest that you do from some of your earlier remarks. How does what you are suggesting address the problems that they identify?

Sir Ben Gill: First, the point is this. To compare what has happened with the Capital Grant Scheme two, three and four years ago with where we are today, because of the economics, is not a fair comparison. We were moving into the new scenario and we wanted to take account of this changed dynamic. Second, I think it is unfair to say that nothing is happening. It has happened where you have had entrepreneurs. You have in Oakham, in the Rural Energy Trust, a shining example of one individual, Richard Harvey, who has taken the subject on and driven this forward and, with the use of grants, is promoting the use of biomass systems and continues to do so very effectively as a shining light in the years to follow.

Q161 Chairman: Could I just ask for some clarification, because there is one item that is confusing me and I have been searching for the references in the report. You mentioned a moment ago that within the grant scheme there should be some recognition of the value of the carbon saved. In paragraph 2.2 on page 18 you make a case for intervention and you talk about what is described as the "social cost of carbon current within Whitehall", and you quote a range from £35.00 to £140.00 per tonne of carbon, and, if I remember rightly, somewhere else in the report you also comment about what the Emissions Trading Scheme (within the UK) prices come in at and what the prices for the same scheme in Europe come in at; so we end up with three or four different prices of carbon. I have to say, I am now completely confused. How do you derive a value for the carbon and what does this term "the social cost of carbon" actually encompass?

Sir Ben Gill: I can further add to your confusion by pointing out that some people talk in terms of carbon, some people talk in terms of carbon dioxide. If I remember rightly, the Emissions Trading Scheme, the EU Emissions Trading Scheme, is based in carbon dioxide, and, of course, carbon dioxide is 44 units of atomic weight to carbon's 12. You have to multiply the carbon value by 44 twelfths to get that; so you get a different set of figures. The attribution of value to tonnes of carbon is very much a social economic calculation, and there have been a variety of experts who have come up with figures for that. Perhaps the most noticeable one was about four years ago when they came up with a base figure of £70 per tonne of carbon which would then inflate with each year's inflation. This is very nebulous. What we then looked at was the cost of the various schemes by looking at the element of subsidy going into it. If you look at, say, the cost of ROCs, and I believe you have looked at some of that, and certainly the Environmental Audit Committee has looked at that, that would suggest a figure rather in the order of £270 per tonne of carbon as the transfer figure cost in there. If you look at what we are suggesting in terms of the Capital Grant Scheme and you put that on tonnes of carbon saved, given a particular scenario, we could be achieving carbon savings there for as low a cost as £20 per tonne of carbon. The variations in value per tonne of carbon depend on what system you are using and what assumptions you are using.

Chairman: I think we are going to have to probe this with those in Government who have set these prices: because it is often quoted that investment decisions in the energy scenario forward from now will depend upon what the price of carbon is but, I have to say, I am still fuzzy, and it is a failure on my part to fully understand how this money value has been put, particularly when a term like the "social cost of carbon" has been put forward.

Q162 Lynne Jones: As to the amount of investment that is needed, you said that you were hopeful that the Government would accept your recommendations, but you were recommending grants. You said that the cost of your recommendations would be 10 to 20 million pounds a year and you were talking about a five-year programme with a review after four, whereas the Budget announcement was just £10–15 million over two years, and I cannot imagine there is going to be any extra money. Can I put that in context? We had some evidence from Jeremy Woods from Imperial College that if you wanted to supply 10% of the heat market you would need 200,000 50 kilowatt units over 10 years, which would cost about £85 million a year. Obviously, once you had got the programme going, you would hope that the economies of scale

would bring the cost down, but does it not demonstrate the Government's response is rather pathetic at the moment?
Sir Ben Gill: There are two elements to this. Firstly, when we set that figure over the five-year period per annum, if you look at what we have done, we have not put a linear take-up on the technologies. We believe it will be slower in the first part through to 2010 and then the rate of take-up will be greater, and we think it will be double, so it is back-end loaded in that sense. Second, Defra informed me that there have been some problems with the EU state aids, and so, whereas we have worked on 40% of the total capital cost, the EU state aids registration has restrained them to 40% of the margin of additional cost over what it would be as a base figure. Therefore, if you have a gas boiler you have to put a biomass boiler in, and that is down to state regulation. In that sense there is a variation from what we recommended because we were advised that is the EU state aid law.
Mr Clayton: Chairman, just to clarify, the £10–15 million for two years, I understand that actually relates to a five-year scheme but the spending rounds mean that there can only be a commitment for the first two of those years, but there is an expectation that there will be an issue of funding for at least a period of three years.

Q163 Chairman: Can I clarify one other little point. When I asked my initial questions about the nature of the policy in this area what do you think the Government's objective is in giving support to the sector? Is it some reference to energy security, is it dominated by climate change or is it a bit of both?
Sir Ben Gill: One does not speak for Government, Chairman. You must not ask me to do that. They must speak for themselves.

Q164 Chairman: Do you get the sense from having discussed it with Whitehall, in inverted commas?
Sir Ben Gill: The arguments I deployed were climate change is to me an overarching issue that transcends everything. As a farmer, someone who works on the land, I am concerned when I see different climatic factors, not only on my own land but you have just got to look around to see all the different factors that are hitting us every day when you look at the floods in central Europe again this year, and they had them, if you remember, in the last two weeks of August last year: if you look at the drought in southern Europe, if you look at the drought in Kent, the south coast, if you look at the problems just last week in China where the Gobi Desert again took up sand and moved it a thousand miles, and you can go on and on. These things have to be tackled and we need to tackle them now, but that in itself stands as one argument. Even if that was not the argument, I think there is a very strong argument on energy security that we need to use sensibly the raw materials we have. To go back to the point I made earlier, it is just plain crass stupid the way we use our raw materials. We waste as much heat as we could use. We make the point in here in terms of reclaimed timber; we are currently putting into landfill four to five million tonnes per annum. That is the equivalent to the output from half a million hectares of land that we are putting into landfill and when we know landfill is struggling because the rules have got in the way. The incentives are perverse. This needs to change. Look at the hiatus there was last autumn about tallow. It was classified as waste under the Animals By-products Directive and then, because it had been put in there, I suspect without anyone realising what that meant to the Waste Incineration Directive, we had to classify it is a waste product. It got out of the system. We could not burn it sensibly. All these things need bringing together, and energy security becomes a very important issue, not least because we are at the end of the gas pipeline and we are not self-sufficient in gas any more.

Q165 Mr Drew: I have a new obsession, one of many, as some of you will know, that we ought to be turning the heat down in some of our buildings, because our response to global warming has always seemed to be to put the central heating up a little bit more. I was a bit taken aback, slightly tangential to the link within the Renewable Heat Obligation, that you did not think very much of it. To paraphrase the argument, you saw it as rather complicated and long-winded, plus you saw the pressure on the supplier rather than the purchaser. It is a bit depressing in the sense that I think that we completely underestimate, as you have already said in some of your initial remarks, that we do not do enough with heat. It is terrible when people are cold, but we are not cold. Global warming means we should be turning everything off at an earlier and earlier date and we could save some of this energy and try and do something with the heat that we have got to be much more creative. Is there any chance that you might rethink your objection and opposition to the Renewable Heat Obligation?
Sir Ben Gill: Like you, I have an obsession also with turning room temperatures down. I take my jacket off in here because it is actually too hot in this room, it is ridiculously hot, but I would cancel one thought. Global warming does not necessarily mean that Britain will get warmer. We have to remember that we are on the same line of latitude as Quebec, and Quebec regularly has winter temperatures, I think, (and I hesitate with the Canadian High Commission behind me and staring in my back) of $-20°C$ and $-25°C$, which we still have not experienced on a regular basis in the UK; so it may mean that we get colder weather, but that is immaterial to the point. I also have a thing about bottled water, but I will not go into that. I am very keen to have tap water and seek to change that policy wherever possible. I notice that you have bottled water in this revered place. In that sense I agree with you on the terms of turning temperatures down. It is amazing, if you look at it in any establishment, just turning thermostats down one degree centigrade can have quite a dramatic effect. Interesting also is when we went to Sweden (and we talked to them there because they had taken the decision a decade ago, if I remember correctly, to put a tax on heat from fossil fuels which meant that the good residents of Sweden for 10 years have been

paying four pence per kilowatt hour for heat) I said: "How do you cope with fuel poverty?" given that they have a colder climate than us already. They said, "What? Would you explain what this concept of 'fuel poverty' is? We do not have it." Of course the reason they do not have it is because they have had proper building regulations, proper building standards put in place and properly implemented for some considerable time, and they recognise the fact that each one of you is like a kilowatt bar on your heater with a little bit of variation depending upon your body mass, and if you put a dozen of you in here, that is 12 kilowatt bars. These are all heat factors that can be done. We did visit BedZED[1] in southern London, which sought to demonstrate that you need no heating in a room with insulation. You can do much better in that scenario. On the renewable heat topic, the fundamental difference between heat and electricity is that in electricity alone the conversion efficiencies—if you are doing electricity at best it is 35% efficient and at worst 25% efficient—leave a producer revenue deficiency compared to heat alone or heat and power together, even with the prices we have got today, whereas with heat, as I have already said, there is no revenue deficiency. I am well aware of some entrepreneurs who are selling not biomass but megawatts of heat that has come from biomass that are deriving a very realistic market price that is superior in return per hectare in terms of virgin crops to wheat at this time. Given that is the case and given, for example, that even in some boilers you could burn wheat to create heat, and if you take the energy content of wheat and you equate that across to the energy content, say, of burning oil (and I have to admit I have not filled mine up in the last couple of months but I think the last time my wife filled it up in her property it was 37 pence a litre), that would give you a price for your feed wheat, on a revenue basis, in excess of £120 per dry matter tonne. I have recently sold my wheat from last year's harvest at £71 a tonne. That is the difference in the revenue. The point I have made to many people in the farming community is that farmers above anybody else know the problems that have been derived by complex subsidy systems. We are just getting out of that with a decoupled CAP. We do not want to get back into it again when there is a market system there that will deliver a sustainable business in its own right.

Q166 Mr Drew: What happens if everybody starts producing heat? That is the danger, is it not?
Sir Ben Gill: No, I do not think it is a danger because the real situation with energy security and energy demand is such that we are going to need to use every opportunity we can, every source of energy, and if you look at the various demands for biofuels or for electricity and for heat, anything we can do to reduce our dependence on gas, which peaked at over 200 pence a therm recently, that is putting industry way out on a limb. If you look at it, the security that can be delivered from a sustainable source of biomass is far greater. If anything, we have suffered in this country from a problem that in the early part of this millennium, in the early part of this decade, the end of the last decade, energy prices were far too low because we had North Sea reserves and we abused that. Those countries that have had higher prices for energy have sought to diversify and have been sheltered from it. If you look at the EU statistics, for example, for 2003, the average domestic price of electricity in Germany for 2003 was 10 pence per kilowatt hour. We have only just got there, and it was less than half that in 2003 in Britain.

Q167 Mr Drew: Are you not a bit timid then? I know this is not necessarily directly relevant to heat, but what you have said about the building regulations, again it was not necessarily in your brief, but I would entirely concede the point that you have made that we are so neutral in our approach to the way in which we expect developers to do good things, whereas we all know that if every new housing development was made energy efficient and was actually forced to use heat by local heating schemes rather than some of the completely mad ways in which we still expect each house to be an island in terms of its own heating provision, that would drive biomass production forward quicker than anything else, would it not?
Sir Ben Gill: I would not disagree with that. I think you have almost answered the point yourself, David, that the terms of the remit of the Biomass Task Force did not go into that aspect. I strayed outside my grounds in a number of ways, and I did in fact also write a side-letter on a number of issues outside the technical remit of the group to the Chancellor, to the Secretary of State for Trade and Industry and the Secretary of State for the Environment, Food and Rural Affairs. One of the issues I raised was the subject of district heating or communal heating schemes, because they strike me as so much more efficient. We came across one example of a 2,000 house new estate in which the developer, through ignorance, specified that each house should have individual gas-fired central heating. The total capacity of the individual gas boilers put in was 23 megawatts, the maximum gas uptake measured was two megawatts; so you have an over capitalised investment of 21 megawatts. But go a stage further—and this comes back to joined up thinking—you could have put one central heating facility in, over spec it by 50% at three megawatts and you would still save 20 megawatts of capital expenditure. The cost of laying in the pipe work when you are putting in pipes for new houses for electricity and water is minimal in any case. People put up barriers. They say, "Oh, the cost of meters." I am saying you do not need meters. If they are new houses, you build to the proper specification and you can estimate pretty accurately what the heat demand will be. Just as you have a water charge, you have a heat charge perhaps. Then think of something else. Think of the fact that 2,000 houses, if they are on gas, each boiler for true safety reasons has to be inspected every year. Two thousand times £67.00 per year is £134,000. But, even further than that, one of the companies that did the inspection told me that

[1] Beddington Zero Energy Development

on average they spent a further £400 per house on 10% of the houses just getting access because people were not there (repeat visits). 10% of 2,000 is 200 times 400, is another £80,000. Therefore, the cost of maintaining all those boilers is in excess of £200,000 a year. You could pay a pretty good engineer full-time to look after one boiler for that. What we saw in Sweden was one engineer looking at, I think it was, 36 different heating schemes using remote telemetry, and one other benefit. Imagine the scenario: in the middle of winter, the cold snap we have postulated happening, the first time you notice the heating is not working is when you wake up in the morning, and, then, with two parents working, "Who is going to stay at home for the boiler engineer?" who does not come. If you have got a district heating scheme, as we saw in Sweden, by remote telemetry the man has fixed it before you even wake up. Nobody joins this together: because the developer is not worried about the running costs and conceptually it is not seen as convenient. This is why information, the removal of ignorance, is actually at the core of our thinking about renewability, sustainability, energy efficiency and the use of biomass in particular.

Q168 David Lepper: You have just talked again about the lack of joined-up thinking and you began by commenting on that. I am asking to you to speculate on the response from the Government next week. Do you think there is likely to be anything in the response which you feel goes some way towards remedying that lack of joined-upness, or would you prefer not to answer that?
Sir Ben Gill: I am hopeful that there will be some indications that we can start persuading the councils to look at targets for renewable applications. I have to say, from my own personal business front I have had some frustrations. I was recently involved in a planning application where I wanted to put biomass heating in and we put the whole sustainability issue at the top at considerable additional expense and the council were not interested, which I thought was quite despicable. That is not the same of all councils—there are variations, some councils are quite good—but trying to bring all the councils together and understand renewability is an issue in itself, and, no matter what government does, essentially it is the issue of taking the horse to water and you cannot make it drink necessarily. It is getting the awareness up and getting examples, which is why we think perhaps the most constructive example is for central government, the biggest owner of building stock in the country, to lead by example. They have said in the 2003 Energy White Paper they would do that. They have yet to do it. They have a massive school build programme, they have a significant hospital programme; so we would make two suggestions: (1) in the school build programme why do they not put in biomass boilers, and then the parents, who are the most susceptible part of the population who may think that biomass is dirty, inconvenient, inconsistent and unsustainable, would see that it works and the head teacher does not have to go down, as one person suggested to me, and stoke the boiler every half hour and get his or her hands dirty, but you demonstrate it; and (2) why do we not turn on its head the concept of hospitals' energy supply, hospitals that interestingly have a pretty steady heat and power load 365 days a year? The heat may be reverse heat in the summer, so you can use reverse heat to cool, and put in combined heat and power plants in the hospitals and use the grid as the back up, which in some parts of the country is probably more secure. Woking Council, for example, told me that they had had eight power failures in their town centres last year, or they would have done, but, because they had their own the CHP facilities, there was no power failure; so there is a benefit to it. Those CHP units, given the technologies that are emerging using gasification processes, could be quite safely part-fuelled on the hospital's own clinical waste, which saves transporting it, and you suddenly turn clinical waste, which currently has a gate fee for disposal of £200 a tonne, into something that could have a value and you turn the economics round. It is a win, win, win potentially.

Q169 David Lepper: So we go way beyond the old dichotomy we have seen so often in this country between Defra's approach and the DTI's approach. You are talking about a far wider remit of Government departments?
Sir Ben Gill: It is Defra, it is DTI, it is ODPM, it is Department for Transport. I have to say we have found the Department for Education very positive and very supportive given the financial constraints, but they did not come down to the regions and we did spend a lot of time talking to the regional development agencies and, in the main, we did engage them quite sustainably in what they are thinking; but again you get mixed messages in the counties. We did come across some counties where you could almost see what had happened. The county officer thought: "This is an important issue. What should we do? I know; we will appoint somebody to oversee this." What happens? You are asking somebody to be a "jack of all trades", and you, Chairman, highlighted at the start that they cannot master all those details. It is impossible. What happens is that they get confused messages coming out to the people who are thinking about it and the whole system fails. That is why we want something simple, quick, efficient and clear-cut in what we all want.

Q170 David Lepper: David Drew has asked about the renewable heating issue already, but before we leave that completely and taking up your comment just now that we need something that, among other qualities, is quick, one of the reasons why I think your Task Force did not go with the idea of the Renewables Heat Obligation is that you were saying, in effect, the time is too short to prepare and implement in view of the need to tackle climate change urgently. I think the Royal Commission on Environmental Pollution did suggest that the Renewable Heat Obligation would be something worth considering; so does the Renewable Energy

Association. They are calling for an analysis of the feasibility of such a thing. Do you think there is any point in spending time on that?

Sir Ben Gill: At the launch of our report two representatives of the Royal Commission on Environmental Pollution were studying attendance, and they actually spoke—they reported of their own volition, I did not ask them to—and made the point that since they had published their report, which predated ours, I think, by 18 months, the economic dynamics that I have talked about already had changed so dramatically. They recognised that things had changed and they accepted the point that we made, and I think this is the point. We have to recognise that we need to join up all the various bits. I am still amazed, as I go round the country talking to groups, that people are surprised that they have not picked up on what has happened as a consequence of the dramatic rise in oil and gas prices (and nobody is forcing that), not helped, I must say, by the DTI at times insisting that contractors who do studies for them do it on the basis that by 2010 gas prices will be back down to where they were a year ago.

Mr Clayton: The need for legislation for a renewable heat obligation would inevitably mean at least two to three years before a system could be put in place, and one of the things that the Task Force had in mind was that the biomass sector really had suffered from almost a turn-on/turn-off approach from government and therefore they did not really want to see that sort of delay built into any future development.

Q171 James Duddridge: I am a little bit confused. I was going to ask about how to reduce capital costs for bioenergy, but you seem to be saying they are already quite cheap. I am confused because the Renewable Energy Association said that, whilst on a field by field comparison to fossil fuels biomass is competitive, however, owing to the immaturity of the market, capital costs are still nearly three times those of fossil fuel alternatives. I would appreciate it if you could clarify that and also touch on why investors are not recognising the economic impact longer term?

Sir Ben Gill: I am sorry if I have given you the impression I believe that capital costs are cheap. Capital costs are greater than gas or an oil boiler, and some of that is in related kit, although that need not be as dramatically—

Q172 James Duddridge: You are talking £15,000 for a city academy, which in the greater scheme of things is not a lot.

Sir Ben Gill: No, but it is a factor. Remember that when people are building in quotes of £170,000 quite often, that is a barrier in itself, and when I got to the bottom of it, I got to the bottom of it by talking to one of the UK's leading manufacturers in this, and he said, "This is common place. I have this regularly happening", were his words to me, because the intermediaries do not understand. If you are used to dealing with a system, you prefer to deal with that than going to something new. It is second nature. This is what happens, so people build in. On a parallel story, we came across, I think it was, Southampton Council, who had insisted on a district heating scheme going in. The developer, Barratt, had resisted it because it did not want to do it, but having done it found it was cheaper and wanted to do it the next time round of their own volition. They were resisting it even though there were figures there that said it worked. That is part of the inertia: something different. Part of the inertia is, "It is all right you, Gill, saying you will supply to biomass, but you might not be there next year. Where are we going to get the supply from?" We have to tackle that. I think we tackle that by the Government flagging up front we are going to do this because we are aware of the point the Chairman has made about climate change and energy security. We are going to create this demand and we are signalling that two, three, four years down the road we are going to want it so there is the market. You go on and produce it. It will not be a single market supply, it is going to be a diverse market supply with a mixture of virgin biomass—that is short rotation coppice, miscanthus, straw—coupled with non-waste biomass. You could look at aspects of reclaimed pallets, waste timber or you could go into municipal solid waste, reclaimed fuels, or you can go into wet wastes. We waste as much food in this country as we eat. It is a startling statistic, but if we are serious about sustainability, should we not be able to do something about that?

Q173 James Duddridge: We will come to wet waste, if that is okay, later on. If we take the city academies, I have got this picture of big lorries trundling through with feed stock for a burner. How have the Danish overcome the associated transportation costs for biomass and processing costs and what lessons can we learn from the Danish?

Sir Ben Gill: You are quite right; biomass does not lend itself to be transported from one end of the country to the other. That would be nonsensical, although there are some nonsensical transport practices that go on at the moment in terms of how we transport coal that is imported from one side of the country to the other rather than importing into the right port, but that is another issue. What we need to do is mirror local supplies with local energy needs and put them all together, and we recommend in the report that the Government and the regions in particular should have maps. For example, one county council I talked to in the south-west, I suggested that they look at their industrial parks. As a county council they assess what is the energy need of those industrial parks in terms of heat and electricity; they then look at what refuse they have and estimate what is the energy capability of that, what is their other biomass availability, put the two together and act as facilitator. They have to deal with the rubbish. They can go into partnership with the industry perhaps to buy the energy if it wants the energy and it becomes that much more efficient. You are putting it all together to develop it in that sense, and so we think that that is a sensible way to go ahead. I have lost the thread of the question now.

Q174 James Duddridge: It was about the Danish example and what can we learn from them?
Sir Ben Gill: I think by siting the facilities you can get round a lot of them. Remember that in cities as well there is a base load of arboricultural arisings—these are tree surgeons' chips—which amount to about half a million tonnes a year. You have got all sorts of things that you can add up and put into it. You can do it with municipal waste. It can be done there. I understand in London in the Lea Valley they are going to bring wood in on the canal. It is using innovatively. The better way is to use and generate it nearby. Having said all that, I think you have to recognise that biomass cannot supply all the heat in the country, so we use it to teach where it is best used most efficiently.

Q175 James Duddridge: One last question. There are issues around people being ignorant of the opportunity and, second, there are issues around having a long-term security of feed stock. You seem to be saying that if the Government through some major project like city academies and through its own efforts will actually generate a sufficient demand, the public will have reassurance and come in off the back of that. How much demand does the Government need to create in order to maintain momentum for private sector investors to have the security of buying a Barratt home knowing they are still going to be able to buy this stuff after five years rather than having to plumb in a new gas boiler?
Sir Ben Gill: Mr Clayton will answer the question on Denmark that I forgot to answer the second time first.
Mr Clayton: I think in Denmark what was particularly successful was community ownership of schemes and therefore there was a commitment by the community to see them work effectively, and that was underpinned by a co-operative approach from farmers, particularly the feed stock supply, the emphasis being, as Sir Ben has said, on supply from the local area. Those two aspects are really what made a success of district heating in Denmark, set in the wider context where there was the tax on fossil fuels that subsequently evolved when there was a change of government and there was some doubt introduced into the market about the future of the funding schemes. Essentially within Denmark it was the community ownership of the district heating underpinned by very strong co-operatives on the local farming side.
Sir Ben Gill: I am sorry, can you put the question again.

Q176 James Duddridge: The final point of the question is really how much demand does the Government need to generate in order to be able to give Joe Public and Barrett Homes the confidence that there is going to be security of supply?
Sir Ben Gill: We thought there were two elements: one is clearly in the new-build programme—there is clearly a very good opportunity there—but, second, we suggested that, in terms of public buildings, the normal life expectancy of a central heating boiler is 20 years. Given the amount of buildings the Government owns and ought to be reviewing and all the boilers that are up for replacement, they should actively consider the introduction of a biomass boiler. That is not as draconian as it sounds. If you take Barnsley Metropolitan Council, for example, people had all their boilers based on coal, for historical reasons. They have changed them over to biomass already, and so it is relatively easy to do. If you are putting in a new biomass boiler we believed there was an argument—because there could be if Government wished—that you could have a significant uptake of the new boilers, and not necessarily one in 20, we think for economic reasons you could probably accelerate that to one in 15 and you could have a significant uptake of biomass demand in government buildings. I have not the figures to hand, but we could work them out for you.[2]

Q177 James Duddridge: It would be useful if you could.
Mr Clayton: The issue alongside that, Chairman, is how much the Government does. There is also a message that comes from the Government—the point, Chairman, that you made right at the beginning. The whole list of grant schemes in the annex really says that the approach has been fragmented. If alongside the development there is actually that consistent strategic message from government saying that it wants to develop biomass energy in all its forms, that is absolutely crucial. Again, going back to Denmark, part of the success in Denmark was over a period of probably eight or nine years a very strong consistent message saying, "We want to develop biomass energy. There will be this support that goes in to get the industry up and running", which then subsequently, with the change of government, actually diluted that message, but the key point is that alongside the practical development needs to be the strategic message and the commitment to the development in the longer term.

Q178 Lynne Jones: Can I first of all ask you, Sir Ben, were you as passionate about these issues before you were appointed to the Task Force?
Sir Ben Gill: I believe very strongly in what I am doing. No, I was not. I learnt a lot.

Q179 Lynne Jones: You are a good example of the education.
Sir Ben Gill: Indeed so. It is also correct to add that the dynamics of the whole thing changed. Having said that, I planted my crop of short rotation coppice nine years ago.
Chairman: I will suspend the committee for 10 minutes while we go to vote.

The Committee suspended from 4.24 p.m. to 4.40 p.m. for a division in the House

Q180 Lynne Jones: I want to ask some questions about how we maximise carbon saving from the admittedly limited resources available, particularly

[2] Ev 86

land. A little earlier, Sir Ben, you said that you had already yourself been growing short rotation coppice, but there is a problem with that, because you do not get the rewards from the planting of coppice and miscanthus, as I understand it, for three or four years, and that may be a deterrent. We also have mixed signals coming in terms of renewable fuel obligations, and so on, and we know that there is a greater carbon saving from using biomass for heat and power than for fuel, and yet all the green signals are saying biofuels are the way to go. How can we ensure that what biomass is produced is being used in the most carbon-efficient way, and what role do you think research and development has got? I notice you have a whole section of recommendations on research. How important is that and what signals do you think the Government is giving? We have heard, for example, that some research institutions are being closed down. It is not mentioned in your report, but what potential do you think there is for marine-based biomass?

Sir Ben Gill: I did email to the secretariat yesterday one of the presentations I had given, and in that were some figures that touch on some of these issues.[3] One of the slides that I used is: "How do we derive maximum value and efficiency from biomass?", and I tried to reduce it to fundamental principles. I said first of all we find a process that extracts the maximum percentage of the implemented value of the product. You have got to look at this. Do you go through a process that gives you 30% efficiency extraction or 90%? If you are into combined heat and power or if you are into heat only, some of the most efficient boilers now can give you 90% efficiency for energy extraction. If you are putting it through an electricity only plant you are down at 30, 35%. Drax will tell you they may do 37% efficiency; so it is logical how much you can pay for it. Once you have done that you should seek to do it with the minimal amount of capital investment that is necessary and with the minimum amount of energy losses, efficiency losses, in the transformation while identifying the maximum market value for that product. Those are simple and quite obvious guiding principles but they are ones that perhaps are ignored sometimes when we go hell bent down one road rather than looking at the fundamental points. I think the specific answer to your question, and one of the concerns we pick up in the report, is how are we going to determine which is the most carbon efficient when there is no internationally accredited basis for setting up proper life cycle analysis? Before I give you the example there, we did visit Iogen's plant in Ottawa, and one of the questions I asked them was about life cycle analysis, and they said, "Oh, yes, it is very good." I said, "Tell me what value you put on the cost of your raw material, your maize stover", or in this case it was wheat straw. They said, "We put nothing on that because it has all attributed to the seed." There was a dilemma here. I understand the dilemma, and it is not black and white, but I do not think it is equitable in life cycle analysis to say there is no carbon cost to straw as a by-product or maize stover as a by-product just because you use the seed. It should be an agreed basis of apportionment of assumptions on which we do things to get carbon accreditation. In terms of carbon efficient, we need to look at that and have an agreed set of life cycle analyses, and I still come across this, even most recently as two weeks ago when I was talking to a scientific community in the UK and they were raising the issue. There is no independently validated life cycle analysis basis for assumptions on which we can ground proper meaningful comparisons at every stage. I talked to OECD and they said, "Oh, you should talk to the International Energy Agency", and they pass you on. Somebody should be doing something about this. Who should it be? I think the Government should be pushing this. The Government is the only body who can push it, either within the G8 or within the UN, I do not care which framework, so that we do not just bandy figures.

Q181 Lynne Jones: We cannot wait until all that is internationally sorted out. We have to have some broad thrust of going forward in a rational way. We have our own scientific advice and expertise. How are we going to approach this? We want clear policy signals that will maximise the carbon savings from the kind of technologies that we encourage.

Sir Ben Gill: If you are going to maximise the carbon savings, you must use the most efficient system of transformation from one to the other. If you are looking at growing a crop, you are looking at energy balances. The energy balance of growing biofuels, depending on the use of the byproducts, is two or two and a half to one. You get two or two and a half for every one you put in. It varies between which crop it is and the system. That is in this country. If you are looking at miscanthus or short rotation coppice, it could be in the high twenties to one. I put that in context. Much has been made of the potential for using oil that is going to be extracted from the oil sands in Canada. The energy balance there is only three to one, three out for one in, because you have to steam out the oil from the tar sands. A lot of energy goes into steaming it out. In that sense, it is comparable but in terms of production per hectare it makes you look at what you are doing with the crop yourself. Using it for heat is a simple process. It is minimal capital investment and it is quickly achievable because the boilers are there. The research and development element is a very important point. We visited Finland and we were very impressed by the organisation called VTT, a part state funded body. From memory, it had funding of around £200 million per year and it is part industry. It performs a role that was destroyed in this country 20 years ago in the mid-eighties in the Rothschild review of research that deemed that government should not be involved in any applied research at all. All too often we see to this day basic research is done and there is no joined up application. I started growing coppice nine years ago for the failed Arbre Project. We talked to the scientists in the VTT equivalent. They said, "If we had been approached, we could have made that project work. We know what is wrong with it", but

[3] Not printed.

nobody joined it up. We do not have that applied research capability, that joins up with the basic research in this country. The need to join it all up, to understand the transformation technologies, is rather critical in going forward, as is the need to join up and understand the agronomics of the crops we are going to grow and the research also into another area that we have not touched on yet, which is using plant products as general industrial raw materials for industry, something that I believe is incredibly important. We did see in the National Research Council laboratories in Ottawa, state funded again in conjunction with industry, a product that had been derived from maize starch with a derivation of polylactic acid which is already widely used elsewhere in the world for the casings in laptops, for example. They were patenting it at that time and they believed it would be quite capable of replacing the steel in a motor car. If you think about what that means in terms of potential for our society, it is quite amazing. I did mention it to the retired chief executive of Toyota UK. He went into eulogies of thought. The car becomes lighter. The fuel efficiency rises. There is the renewability. At the end of the vehicle life, you can chip the vehicle chassis and use it as a heat source or an energy source or put it into some other secondary use. We do mention in the report chains of utility in the vision document, which is what we are talking about here but we need the coordinated research into these areas. We have the basic research to take it through so we do not get into the simple Joe Bloggs end but into the real added value end to the benefit of the country as a whole. Finally, on marine biomass, marine biomass has enormous potential to harness the sunlight. A lot is talked about that. I am afraid I am not sufficiently up to speed to answer the question in any detail. It is something I have read just at the margins in the newspapers. The biomass amount is substantial and it could be harvested and potentially be used.

Q182 Lynne Jones: The Biosciences Federation have raised that and the use of chemicals in the chemical industry. Do you envisage one day that we might have a situation where you can take a crop and different bits of that crop will be used for different purposes, so it could be used for food, for biomass or biofuels? One of the areas we heard about when we were in California was the use of enzymes and cellulose digestion. I think even George Bush mentioned it once in a speech. Have you any thoughts about this?

Sir Ben Gill: I do. I concur with that vision very strongly. The developments that have been made in science in developing ways of taking lingo-cellulose products and converting them into energy in the last year alone have been significant, as indeed have some of the research findings on the production of hydrogen using bacteria where in the States, they have quadrupled the output in the last year. The whole business of the green plant is what I call the natural biorefinery. Rather than using the plant to take the product and put it through a complex industrial process to get what you want, you take the plant and change the plant to produce the products you want to start with. You breed wheat to produce higher starches or even to do something else. That leads into another question which is very controversial: GM. You can very easily take the plants to produce whatever products you want in a much more environmentally sustainable way than anything else. To go back to your question, I see that the plant will be fractionated. You use parts of this, whatever is opportune at that time. The byproducts will go directly into energy. Straw may go into energy from the wheat in the field and so on. If you look at the classic example, it is sugar cane in Brazil. They fractionate the crop. The best part goes into sugar; the next part goes into bioethanol. The residues go into the energy generating plant on the site that creates all the energy for the plant and the residue from the energy generating plant goes back as fertilizer on the land.

Q183 Lynne Jones: What, if anything, should the government be doing to fast track these technologies?

Sir Ben Gill: What frustrates me, not just on this but on the whole gambit of what we are talking about, is the lack of strategic overall vision, tying together all these points of climate change and energy security, coupled with the issue of food security in the future, because we have a finite amount of land. Some people have told me I should not be talking about this but I am going to ignore them. When you look at what is happening in the world, the ability to produce, with water becoming a restricted factor, with the increased dependence in China on imports of food as they move people to fuel their industrial revolution—GDP up by 10% in the last quarter—by moving people from rural farming there is going to be a big challenge about how we use our land and it is coming sooner than people realise. Unless the governments of the European Union and the world as a whole recognise this, we are in for big trouble.

Q184 Chairman: On the question of use of land, in your report on page 12, *Vision for Biomass,* you say, "We have assumed that around one million hectares of land may be available for non-food uses." I may be wrong but I think the National Farmers' Union quoted a million and a half hectares in the context of biofuels on the liquid side. Have you added up all the various competing claims for what land is available for biofuels of different types? Can you put it into some kind of proportional context because you also made the telling point about food and food security. There have been some concerns expressed that developments of biofuels in the generic sense represent a point of competition, notwithstanding what Lynne Jones has just said about fractionating plants, for land that could be used for fuel.

Sir Ben Gill: That competition is very real. Before I answer the substantive question, I will give you an example. If you go onto the BBC website, if you go into markets, more markets and commodities at the bottom and look on sugar futures, there are two sugar lines there. There is number 11 which is the New York futures on raw sugar and number 14 which is the refined sugar prices. If you click on that

line at the bottom it will come up and show you the prices over the last month. You can see a drop down box and call up the graph over 12 months. You will see the price in both of those has more than doubled in the last 12 months. It was in the papers today. I read it this morning as I was sat in the car park known as the M1 for two hours, coming here. Refined sugar is up to $480 (interestingly the new intervention price) because of the conversion to bioethanol. It is one product going two ways: energy and food. There is not a shortage of sugar. Demand for bioethanol is driving it up and, as oil prices go up, the sugar price goes up.

Q185 Lynne Jones: Bioethanol is not a very good way of saving carbon.
Sir Ben Gill: It depends which process you are using and which country you are doing it in and the same for biodiesel, which country you are doing it in and which way you are doing it. I think we will have to look at this holistically, not just from a British or European viewpoint but from a world viewpoint. If you take the EU objective, not the British government's, of 5.75% by 2010 and you assume the current trend lines in the popularity of diesel at the expense of petrol, that would suggest that the demand for diesel in 2010 would be just short of 25 million tonnes and just under 20 million tonnes for petrol. On standard yields, to grow that, if we were to grow it all from rape which we cannot because you have other factors coming in you would require approximately just under a million hectares of rape. I would assume that you would still want us to go on growing half the million hectares of rape we grow for food use. There is immediately a question then of one and a half million hectares of rape in our total arable capacity in the UK of 4.7 million hectares. That is not sustainable agronomically.

Q186 Chairman: You were talking about the total, 45 million tonnes, of diesel?
Sir Ben Gill: No. 25 million tonnes of diesel.

Q187 Chairman: 25 million tonnes of diesel takes four and a half million hectares?
Sir Ben Gill: No. 5.75% of 25 million tonnes is 1.43 million tonnes of biodiesel. That would not happen because you would reuse chip fat and import it but I would put that into context. Particularly in Britain, where we are a very heavily populated island, the amount of land to the population is not very great compared to, say, France or Germany. For bioethanol, the figures are different. For petrol, if you put bioethanol with petrol, you get the same figure. If you do it by wheat, you would need to produce 1.1 million tonnes of bioethanol. For wheat, you would need just under half a million hectares of land. If you did it by sugar beet, you would need about 275,000 hectares of land. We are talking here of either one and a quarter or one and a half million hectares of land if we are going to do it all, just to meet the 5.75. Nobody is suggesting we are. We need to think very seriously about this given water pressures, given the report that appeared yesterday from ADAS about the problems of achieving nitrates levels and the suggestion that we may have to start grassing down parts of the country, something that would be totally ridiculous, I think, but we have to think of these contexts, if we were to go further to a target, as the Commission has been talking about, it would be about 10%. It is a balance and it comes back exactly to your question about life cycle analysis. We need to have a handle on the life cycle analysis of where all the options of our energy come from so that we can factually compare them and not do it on emotion. There is emotion in this particularly with some of the imported biofuels when they attach it to the degradation of rain forests. That should not happen. To assume that all biofuels come from degraded rain forests is equally wrong as is saying that none does. I hope that answers your question.

Q188 Chairman: It does. Do you happen to know what the cultivatable area for food crops in the United Kingdom is?
Sir Ben Gill: It is about 4.7 million hectares of arable land and about another five million hectares of rotational grassland and another block of permanent pasture, but of course you cannot plough permanent pasture out any more under the CAP rules of cross compliance. We will still need large elements of that rotational grassland in there. That is without talking about biomass itself. If you start putting in biomass for heat and electricity on top of that, you are adding to that demand on land. Hence you see why I become concerned.

Q189 Chairman: Given all of these factors, is it rational for the European Union to have this €45 a hectare grant for growing energy crops on set aside land?
Sir Ben Gill: I do not think it is rational that we still have set aside, full stop. I argued against the retention of set aside in the 2003 reform. The only reason we got it as far as I could tell was because the French needed something to hang onto because they lost so much face. I would expect that when our Secretary of State goes into the debate on the mid-term review in a couple of years' time that would be top of the agenda to get rid of. It is a nonsense.

Q190 Chairman: £12 an acre seems to be neither here nor there in agricultural terms.
Sir Ben Gill: It is ridiculous and the bureaucracy and paperwork that go with it are destructive.

Q191 Lynne Jones: In the context of the effect of the renewable fuel obligation and the reliefs available for that compared to what grants you are suggesting should be put up for biomass, what are the equivalents in terms of per hectare of biomass, the subsidies for the two systems?
Sir Ben Gill: In terms of what we have suggested alone for heat grants it is very minimal in comparison. We worked it back on per tonne of carbon. It was £20 per tonne of carbon saved and that was a pretty conservative figure, which was far more effective than anything else. Heat is the best kept secret. It is the lowest hanging fruit and we have

got hooked up on everything else largely because a lot of other countries have and we have ignored heat. We need to do that. Think of the resources. The best area to use renewable heat is in the more remote areas of our country that are off the gas grid. We could rejuvenate our forestry. Think of which is the region of the British Isles which is the most heavily wooded. Whenever I ask this question in public people say, "It cannot be Scotland. It is too obvious." It is the south east of England. People forget that. It is quite possible to manage those woodlands, to improve the biodiversity of the woodlands and the recreation capacity of the woodlands and to create an economic income stream. That has to be good news because you are creating positive income streams by managing things properly. Think of the forestries where suddenly you have created chains that have valuable woodchip. At £60 I am told it becomes economic if it is environmentally sustainable even to harvest tree roots. Think of the jobs you are creating. They are real and it is sustainable and we just sit here.

Q192 Mr Rogerson: On that very subject in terms of waste wood, the government have claimed that an additional one million dry tonnes of wood fuel could be sourced every year if barriers to active management were removed. In the Task Force report you say that a lot more could be done in terms of waste wood. What is the difference?
Mr Clayton: In terms of availability, good numbers were quite difficult to come by but the broad assumption we came to was that there were about seven million tonnes roughly of wood waste that was going into landfill. In terms of different uses that could be made of that, our conclusion was that three million tonnes could quite readily be diverted into biomass uses. It probably was one of the significant statistics that came out of the study that this material is going into landfill when there is an industry which is capable of transforming it into a usable product. It takes you into the whole area of definitions of waste, when waste ceases to become waste and the thematic review that is taking place in Brussels on that very issue. The challenge of using that material seems to us to be an obvious one that could be taken up quite easily.

Q193 Mr Rogerson: You are quite right to flag up the problems around definitions of waste and in different contexts we have talked to people about composting and the issues around that. Under the renewables obligation, the 98% rule that has now been moved to 90%, waste wood has not been eligible but under the Planning and Policy Statement 22 definition of biomass it is included. What are the implications of the problems of those two different interpretations?
Mr Clayton: In terms of waste wood, there is an exemption in the Waste Framework Directive as well that allows for waste wood to be used as a product. The message we had from industry was that, when there was discussion of various percentages of contamination in the material, do not move to 95% if we can achieve 94. The move to 90 was very welcome. It meant that this sort of material could be taken in. The whole issue of eligibility for ROCs and the implications of that are quite serious. That move to 90 was significant for the use of that waste material.
Sir Ben Gill: There is very clearly a need to move understanding and thought about the use of waste. There is still a fear that emanates from the period when there were problems with emissions, most notably the dioxin emissions from the Coalite plant in Derbyshire. There is around the country something which I call the chimney aversion. There is public resistance to big companies coming in and putting in chimneys because they are fearful of what comes out of those stacks. When we talked to the Environment Agency—indeed, at the public launch of our paper—the Environment Agency responded stating that they were very clear in their mind that the controls on the emissions from these stacks are absolutely better than anything else and better than they are for many other processes that we have. We can go a stage further. We saw a company at Avonmouth, Compact Power, who put together a mixture of pyrolysis with a carbon drop and internal gasification that, without any stack, is very effectively transforming clinical waste into heat and power. That could be put in place very sensibly and its economics stack up now. It is ignorance again.

Q194 David Taylor: Would you agree that there is a parallel oddity happening in terms of recovered fuel oil? You may have noticed that in the last few months it has not been collected as systematically as it was because a lot of it has been used in the road stone coating industry. The Waste Framework Directive ruled it out for consideration and therefore virgin fuel oil is being burnt in coating the roadside because they cannot get their act together. Were you aware of that?
Sir Ben Gill: I was aware of the whole issue of sustainability and the fact that the regulations and the definitions employed in waste have acted against sustainable change rather than facilitating it. The major one I have referred to already which is tallow.

Q195 Chairman: In recommendation five you say, "Government should continue to fund, at an appropriate level, the work of the Waste Technology Data Centre at the Environment Agency." Is that body under some kind of risk in your assessment or is it inappropriately funded at the present time? If so, what does it do?
Sir Ben Gill: The Environment Agency is dependent upon central government funding largely, to ensure that we have this performance data available to rebut the claims that still come out—we had a press launch with the *Daily Telegraph* correspondent there—that these chimneys were just pouring out pollution everywhere. It is important that we can inform the public of the reality so that they feel comfortable with it. I think it comes back to the point that David made earlier. The difference between what we have had in Britain and the Danish example was that elsewhere public ownership is taken of these schemes. Where a lot of initiatives

have gone wrong is that they have sought to come in and impose schemes rather than take public opinion with them. When public opinion has been taken first, you have a very different approach. We need to keep the information available.

Q196 James Duddridge: I would like to return to anaerobic digestion because the Task Force, I understand, recommended a better strategy for anaerobic digestion of wet biomass and conducting a full economic and environmental assessment of biogas in particular as a substitute for diesel. Yet, looking into it, the government has merely pledged an international seminar on methane emissions. Are you content that the government is doing enough in this area, given the urgent action needed on climate change?
Mr Clayton: The issue of methane is an important one given the damaging nature of methane in climate change terms. That has to be a welcome step by the government. Beyond that, we know very little about what the government might say in response to the recommendations, but our feeling on anaerobic digestion was that, whilst the UK has a number of anaerobic digestion plants linked to human sewage, there had been very little development in on-farm systems particularly. In Germany there has been significant development. There has been support to develop systems but based on a sort of one stage technology. The advice we were given is that there could be much more efficient methods of pursuing anaerobic digestion (AD). Given the limited time that we had to do the study, we were not able to get into the detail of that. Hence the recommendation that there needed to be a very close look at the best way of taking AD forward. We were aware of some work that the Environment Agency were doing for Defra at the same time. What the Task Force was saying was that AD certainly has potential in terms of energy generation but we need to make sure that, if there is funding going into it, it does not go into, in effect, the existing technology that is less efficient than the developing technology.

Q197 James Duddridge: What are the Environment Agency doing?
Mr Clayton: At the time we were undertaking this study there was a review by a couple of people that were seconded from the Environment Agency to Defra to look at the whole AD question.
Sir Ben Gill: It is perhaps one of the hidden secrets of the country that in the heart of England we have the largest sewage farm in Europe. It is not based in some remote outlet; it is based in the corner between where the M42 hits the M6 toll road in Sutton Coldfield. I do not believe the good people of Sutton Coldfield realise they have it there. It takes all the sewage from Birmingham and substantial parts of the Black Country. Through a bank of anaerobic digesters, it converts it into gas which then goes into a row of electricity generators which feed the plant and feed into the grid. The heat is used to heat up the anaerobic digesters and all the buildings on the site. The digestate is then marketed as a fertilizer. We potentially run risks again about what the designations of all these products are and we have to be very careful. This is a sensible approach. On farms we could look at cattle slurry, as has been done elsewhere. Cattle slurry has a slight problem in that it is not a 365 days a year production system. Most cattle will go out in the summer period and the slurry is not available. Pig slurry is available 365 days a year. You could mix it up with the other forms of wet biomass, food waste. Pig waste works better, I am told reliably by an expert, in an anaerobic digester than cattle waste. If you add in food waste, it works even better. You are beginning to get the sense of putting everything together to get valuable fertilizer. People need to look at this in the round because they need to focus on the fact that it is quite feasible that nitrogen fertilizer will soon be over £200 a tonne. You then need to factor in the value of the digestate. I find in some limited work I have done since we published the report that nobody is pulling all this together properly yet. This is what we need to do. All points need to be drawn together to give a vision.

Q198 Lynne Jones: Who runs the Sutton Coldfield plant? Is it Sutton Energy?
Sir Ben Gill: Yes.[4]

Q199 Chairman: One question that has been intriguing me is the question of cofiring and ROCs. I received representations from those who run DRAX arguing that the drop in the value of the ROCs was bad news for cofiring. One of the arguments that they put forward in the correspondence was that the government had changed its mind on this because it did not want to inhibit a generation of other forms of renewable power. I struggle to understand why, when cofiring seemed like a good idea, you did not simply encourage as much of it as you could and, at the same time, encourage other things. Can you explain to me why did the government change its mind? Was it a correct policy choice or not?
Sir Ben Gill: I do not believe the government reacted suddenly. They flagged up this change some considerable time beforehand. I have had communications with the business sector with regard to the changes and similar assertions have been made to me about the changes in ROCs, although I have asked for evidence of the change of value for ROCs and there seems to have been no auction since the change over date to substantiate it at this stage. It needs to be substantiated. Why did we not focus more on ROCs? We were on the horns of a dilemma. One of the major criticisms we had of government, which we made in some of our earlier progress commentaries, was that the whole renewable energy sector had suffered from continually changing government directions. This confused people. Industry in particular will want to invest substantial sums of money with a payback that will probably take a long period and the government have changed policy drivers. We were torn. If we made substantial comments about cofiring we may be achieving criticisms of a government that we were saying were wrong

[4] *Note by witness:* This answer is incorrect; the question was misheard. Severn Trent run the Sutton Coldfield plant.

anyway. We looked at ROCs. Bearing in mind they are currently time limited and will fall out of the system with regard to biomass largely by 2015 because the coal fired power stations are going to drop out, we then looked at where we were. It comes back to the principles that I described about maximum efficiency of process. I was a grower for "Arbre". The group that I belong to has put wood into DRAX. When you look at what you have to do to put wood into a coal fired power station, it is important to realise that the wood has to be in a similar form to coal and the coal goes in as dust. It is ground through mills. To get the wood down to that form is quite costly. It is almost akin to putting a square peg in a round hole. Notwithstanding that, the use of the cofiring initiative has stimulated a supply chain which is commendable, but the ability to pay a price for that product is restricted by the inefficiency of the process compared to a heat only process so we sought to major on the heat only process alone.

Q200 Chairman: At the domestic level, the Energy Saving Trust has indicated that there could be a 3% reduction in household carbon emissions if biomass was used. Do you think that consumers realise this? What kind of supply chain could they look to if they were to embrace the use of biomass? Is that an area that ought to be looked at, notwithstanding your comments earlier that you are strongly in favour of district heating systems—in other words, biomass in bulk—as opposed to biomass in little bits and pieces?

Sir Ben Gill: The efficiencies of district heating are there to be seen. You cannot ignore the fact that a lot of the biomass will be in regions that are remote from large conurbations so there will be a need to look at smaller systems. The development that I am doing on my own farm in North Yorkshire will be built with a biomass boiler. I will use my own biomass commercially on site. The case for smaller ones needs to be taken through though as the supply chains develop. I am aware of certainly one business that is producing a very high quality wood chip that will work in a number of boilers today and could be bought at a variety of stores just as you might buy a bag of coal and would fire accordingly. You could tip it into a hopper. We saw in Finland one domestic residence that was not quite completed. It was being built by an engineer and he had put in the garage a small building. Where you might have seen the oil tank he had his hopper. He was using wood pellets but you could, with the quality of wood chips that is achievable now, put the wood chips in there and it fed automatically into the system. There are boilers now marketed in the UK—Baxi Technologies, for example—that can be powered either by wood pellets, wood chips or even wheat. It is computer controlled and you just programme in what the product is. The market is there. What we believe will happen is that if the government demonstrates by example, then you have these supply chains built and other people will build on them.

Q201 Chairman: Thank you very much indeed. It has been a fascinating insight into this area. You have lost none of the enthusiasm you demonstrated in your previous incarnation as the President of the National Farmers' Union for trying to explain to people sometimes very complex subjects. I do not think I am left in any doubt that this is still a complex area but I think you have identified clearly where you think the best results could be obtained by the use of biomass and, to that extent, the Committee is very grateful to you for your presentation, for your evidence and obviously the report you produced for a wider audience. Thank you both very much for coming.

Sir Ben Gill: Thank you. I am very clear in my mind that it is not going to be a matter of doing this or that. Do we do biofuels or biomass? Do we do virgin or waste materials? We are going to need every opportunity. There will be strategic needs to do biofuels but they need to be put into a holistic picture that is adequately and properly communicated to the country as a whole as part of a strategic plan with a vision for the use of the UK, European Union and World land mass as a whole.

Memorandum submitted by Sir Ben Gill, Leader of the Biomass Task Force (Bio 31)

BIOMASS TASK FORCE ASSUMPTIONS PAPER

1. The basic conclusions in the Task Force Report are:

- Biomass heat could take a 3% and 7% share of the heat market by 2010 and 2015. (This will require increases of 2% and 6% respectively.)
- Electricity from biomass does not, in carbon saving terms, justify support beyond what is already available. (Support currently exceeds £290/tC.)
- Action is needed on energy from waste and anaerobic digestion but no specific support measures are proposed.
- Current co-firing rules provide an opportunity to which industry needs to respond.

2. Of the recommendations made, only one of the proposals has significant cost implications to Government and is not a proposed continuation of an existing scheme; this is the proposal for biomass heat targets with support at 40% of capital costs (Recommendation 1). The main points covered in this paper are:

- Justification of the 3% and 7% targets.
- Quantification of the carbon to be saved.

— Cost of the support scheme.

— Cost of saving carbon.

JUSTIFICATION OF THE 3% AND 7% TARGETS

3. The FES report (Renewable Heat and Heat from Combined Heat and Power Plants—Study and Analysis, August 2005) gave the following figures for heat markets:

	TWh/y
Residential	452
Commercial	205
Industrial	81

Task Force assumptions:

4. In the commercial sector, 53.5TWh/y of the 205TWh/y total heat energy demand are from the education, government and health sectors. Normal replacement of heating boilers within these sectors would be over a 20 year cycle (ie with 2.68TWh/y of capacity replaced annually). However, a positive programme of public procurement (as proposed within the Biomass Task Force report), with grant assistance for those sectors which are eligible, could see boiler replacement moving to a 15 year cycle (ie with c 3.57TWh/y replaced). It is assumed that at least 50% of this capacity would be eligible for grant assistance. (This would generate up to 1.8TWh/y.)

5. Taking the remainder of the commercial sector and industrial sector together (total capacity of 232.5TWh/y), a 20 year replacement cycle is assumed. This would lead to 11.62TWh thermal capacity being installed annually. The calculations which follow assume a range of levels at which grants for biomass systems are taken up.

6. In the residential sector (452TWh annual demand), a 20 year replacement cycle is also assumed, requiring 22.6TWh to be replaced each year. Again, different assumptions are made in the following calculations as to the take-up levels for grant assistance.

Calculation of targets

7. The proposed targets of 3% and 7% are equivalent to increases, over the existing 1% of renewable heat, of 14.8TWh/y and 44.3TWh/y. In years one to five (the period covered by the proposed grant scheme), the required average annual increase would be 3TWh and in years six to 10, 6TWh. This could be achieved by the following contributions:

8. In years one to five, the target could be met by:

	% of annual installed capacity supported	*Annual Contribution*
Public sector[1]	33.3	1.2TWh/y
Commercial	7.5	0.9TWh/y
Residential	4	0.9TWh/y

9. In years six to 10, the target could be met by:

	% of annual installed capacity supported	*Annual Contribution*
Public[1]	50	1.8TWh/y
Commercial	20	2.4TWh/y
Residential	8	1.8TWh/y

10. While the grant scheme is initially proposed for five years (with a review after four years), the assumptions of installed capacity for the period of years 6–0 reflect the anticipated ongoing pressures from climate change which will encourage (by financial support or other means) the move to lower carbon technologies.

[1] This includes both grant-assisted and non-assisted installations.

Fuel supply availability

11. To meet the targets, adequate supplies of appropriate feedstocks must be available. Appendix D of the Report shows an annual dry feedstock potential of c 17 million tonnes and wet feedstock of c 3 million tonnes, giving total feedstock potential of 20 million tonnes per annum. For some of the fuel sources identified the figures are seen as conservative; availability of wood waste and forestry material, in particular, could increase considerably with higher prices for the feedstock.

12. These combined feedstocks, if used for heat generation, could produce up to 56,000 GWh (56TWh). This is 27% more heat energy than is required to meet the 7% target (ie 44 TWh).

Quantification of the Carbon to be Saved

13. The report states that if 3% and 7% of heat comes from renewable sources (ie 2% and 6% increases in biomass heat), it will result in savings of an additional 0.9 million tonnes of carbon (MtC) and 2.7MtC respectively.

14. These values for carbon savings (from paragraph 4.12 of the Biomass Task Force report) were calculated using the assumptions made within the FES report, to allow direct comparison with FES estimates of projected carbon savings. The assessment of carbon savings presented in Table 2 of Appendix D is slightly higher, in terms of carbon saved per TWh, than the FES value (0.07MtC/TWh compared with 0.06MtC/TWh in the FES report). This difference is due to the use of different assumptions for the mix of fossil fuels displaced by the biomass heat and the inclusion, by FES, of emissions factors for non-waste biomass. The following values for the 2% and 6% increases reflect this range in carbon saved:

% of additional heat demand met by biomass	*Increased generation (TWh/a)*	*Associated carbon savings (MtC/a)*
2%	14.78	0.89 – 1.03
6%	44.28	2.66 – 3.10

15. If all the available feedstock (56TWh/a) were to be used for heat generation, the total potential carbon savings would be in the range: 3.3–3.9 million tonnes of carbon per annum. Using the Kyoto baseline for carbon emissions this is equivalent to 2.2–2.6% of total emissions.

16. Biomass for energy, and for heat in particular, therefore currently has the potential to make a significant contribution to international and domestic emission reduction targets.

Cost of the Support Scheme

17. The report proposes that the Government introduce a capital grant at 40% of cost for biomass heating systems. It gives a range of costs at £10–20 million per annum. The cost of biomass systems varies and information from commercial sources gives an average installed cost of around £100 per kW.

18. During the period of the proposed grant scheme (in the first instance, five years) the annual increase in capacity will average 3TWh/a. (This figure is based on the 2% increase (of 14.78TWh/a) averaged over the five year scheme life.) The following table illustrates the impact of utilisation rate on costs:

Annual installed capacity	*Utilisation rate (hrs/a)*	*Total capacity (MW/a)*	*Total cost of systems installed*	*Cost to Government @ 40% grant*	*Cost per MWh*
3 TWh/a	8,760	340	£34.0 m	£13.6 m	£4.53/MWh
3 TWh/a	8,000	375	£37.5 m	£15 m	£5.00/MWh
3 TWh/a	7,000	429	£42.9 m	£17 m	£5.67/MWh
3 TWh/a	6,000	500	£50.0 m	£20 m	£6.67/MWh

19. This assumes that the total annual installed capacity of 3TWh would be met through grant-assisted systems. As a proportion of the 3TWh/a would be expected to come from the Government estate, which would not be eligible for grant assistance, the overall cost to Government would be lower.

20. No cost assessment has been made for years 6–10, because the status of grant assistance for that period is not known.

Cost of Saving Carbon

21. With a projected cost of the grant scheme, from the table above, of between £13.6m/a and £20m/a, total costs over the five year initial life of the scheme would be £68 million to £100 million. The 2% increase in renewable heat from biomass, which these figures represent, would result in carbon savings of a minimum of c 0.9 MtC/a.

22. On this basis, and assuming costs and carbon savings are calculated across an assumed 15 year life for the equipment installed, the total carbon saved will be 13.5MtC, while the cost per tonne of carbon will be £5.04–£7.41.

Biomass Task Force

April 2006

Supplementary memorandum submitted by Sir Ben Gill, Leader of the Biomass Task Force (Bio 31a)

COMMENTS ON THE GOVERNMENT'S RESPONSE TO THE BIOMASS TASK FORCE

1. The broad acceptance of virtually all the recommendations of the Biomass Task Force is to be welcomed as a significant recognition of the importance of heat in the wider energy market and the potential to make significant carbon savings by developing the biomass for heat market at a much lower financial cost per tonne of carbon than form most other routes.

2. The key barrier of ignorance still remains however at every level of our society including:

(a) the domestic customer;

(b) the construction companies and associated professionals;

(c) the planners;

(d) industrial and commercial users;

(e) local and regional governments;

(f) national government departments.

3. The announcement of the new Biomass for Energy centre within the Forestry Commission is therefore a critical part of the future success of the implementation of the report. It is critical that this new body immediately and effectively addresses these issues in conjunction with the other Government agencies including the NNFCC, the Carbon trust and the Energy Savings Trust and together with all the Regional Development Agencies.

4. The acid test of how effective this new understanding has been taken up will be seen by how quickly we see biomass as an energy source mentioned together with renewable heat when news stories are reported covering the renewable energy sector. Currently reports focus too much on transport fuels and renewable electricity.

5. The opportunity for the Government to now deliver on the promise that it made in the 2003 Energy White Paper to lead by example is now one that must not be missed. The Government as the biggest owner of property and buildings in the country must show the way ahead.

Biomass Task Force

May 2006

Wednesday 26 April 2006

Members present:

Mr Michael Jack, in the Chair

Patrick Hall
Lynne Jones
David Lepper
Mrs Madeleine Moon
Mr Jamie Reed
Mr Dan Rogerson
Sir Peter Soulsby
David Taylor
Mr Shailesh Vara
Mr Roger Williams

Memorandum submitted by the Biosciences Federation and the Royal Society of Chemistry (Bio 07)

The Biosciences Federation was founded in 2002 in order to create a single authority within the life sciences that decision-makers are able to consult for opinion and information to assist the formulation of public policy. It brings together the strengths of 39 member organisations, including the Institute of Biology, which represents 42 additional affiliated societies (see Appendix). The organisations that have already joined the Biosciences Federation represent a cumulative membership of some 65,000 bioscientists and cover the whole spectrum from physiology and neuroscience, biochemistry and microbiology to ecology and agriculture. The Biosciences Federation is a registered charity (No 1103894).

The Royal Society of Chemistry is the UK Professional Body for chemical scientists and an international Learned Society for the chemical sciences with some 43,000 members worldwide. It is a major international publisher of chemical information, supports the teaching the chemical sciences at all levels and is a leader in bringing science to the public.

Executive Summary

1. UK capacity to produce biofuels (biodiesel and bioethanol) is limited to 5–10% of the total road transport fuel requirement without changes in the production of food crops but with use of exports and set-aside land.

2. Carbon savings would be greater in electricity production than in biofuels and so provision of land for this would exemplify "best use".

3. There is much potential for the production of hydrogen by the highly efficient processing of biomass.

4. There are currently many options for the generation of energy from potential materials. The best of these, including the biorefinery approach, not only produces matter for power generation but also potentially valuable co-products.

5. Given the restriction of available land area, there is great potential in exploiting the extensive marine resources at the disposal of the UK for biomass production, a process which serves multiple beneficial roles beyond that served by the end product.

6. The potentials for bioenergy are unlikely to be exploited under prevailing economic conditions and sectorial approaches. There must be strong links between all those involved including academic research, agricultural production, industrial refining and end users be they public retailers or power companies.

7. Economic factors will drive the success of bioenergy so making this option competitive is essential. Research into the practicalities of scale, efficiency and logistics as well as the creation of an appropriate long-term policy and finance framework based upon this research to support bioenergy in the UK is clearly needed.

8. A successful and essentially long-term emissions trading scheme would be an economic driver for companies offering energy with considerable CO_2 reductions. In addition, the lifetime of support mechanisms such as Renewable Obligation Certificates (ROCs) should be extended to encourage investment.

9. Economic support for ventures including Short Rotation Coppicing (SRC) which have returns after four years following high initial investment is vital for this approach.

10. A roadmap of what research, development and deployment is happening in the UK is critical in establishing the future strategy on biofuels. Cross party consensus towards a long-term direction is essential in realising the full potential possibilities presented.

11. Carbon emissions from the use of biomass or derived products is generally equal to that sequestered during the growth of the source material making the process carbon neutral. However, this depends crucially upon the energy used in processing and production, and the logistics and efficiency of agricultural, chemical, biochemical and engineering practices employed.

12. Achieving sustainability during production would be greatly helped by the publication of best practice guidelines for agriculture.

13. The impact of biofuel monocultures on ecology, for example oil seed rape, is likely to be detrimental, particularly if set-aside land is lost. However, SRC has positive impacts on flora and fauna with a variety of ecosystems supported.

14. Biomass is most effective in reducing CO_2 when the supply chain distance is minimal. This means that importing biomass should be considered carefully in this respect in addition to the ethical and security implications involved.

15. Continued involvement with international research programs is essential, particularly those which are principally similar to the conditions and situation of the UK. The work of the DTI in the area of bioenergy should continue and be built upon.

16. Any headway made in developing renewable energy policy should be mirrored in concerted efforts to improve user efficiency.

Response to Specific Questions

What is the real scope for biomass and biofuels to contribute to tackling climate change? What proportion of the UK's energy and transport needs could they provide?

17. Capacity for biodiesel is in the order of 5–10% of current diesel usage. This would require growing a significant additional quantity of oilseed rape and collecting and processing cooking oil. Bioethanol can be produced from sugar beet and wheat starch in the short term and lignocellulosic biomass in the longer term. Bioethanol can also be mixed with petrol as an oxygenate in low quantities (up to 10%) in unmodified engines, or as the majority component (eg E85 fuel as used in Brazil), however, this requires car engines to be modified. In the medium term bioethanol could provide between 5–10% of current petrol consumption. It should be noted that these fuels could allow the UK to meet the objectives of the Biofuels Directive, although much work is needed to realise this.

18. To exemplify this in a UK context, if you take the three million tonnes or so of wheat that is exported (and assume it is used instead for bioethanol) together with the assumption that all the UK set-aside land is used for oilseed rape for biodiesel production, then the UK could produce around 5% of its current Road Transport Fuel Requirement (38 million tonnes).

19. Electricity or heat from short rotation coppice provides between three and six times the CO_2 reduction per pound that can be obtained from rape methyl ester (RME) or bioethanol from cereal crops used in transport fuels.[1] Given that land availability will be a long-term constraint, crops for transport fuels should logically only be grown where other energy crops cannot be grown or where the demand for heat and power is already met.

20. Biomass fired in dedicated plants, or co-fired in coal burning plants, has a reasonable potential for Combined Heat and Power (CHP) generation, an estimate would be that around 5% of electricity could be generated by such sources in the medium term. It is interesting to note that a number of UK power stations (eg International Power's Rugeley plant) are currently successfully co-firing imported biomass (such as imported olive waste and milled palm nuts from Malaysia).[2] Gasification for power production in engines and turbines is fairly well developed with several demonstration plants in Europe. Gasification can also be used for production of synthesis gas (syngas) from which hydrocarbon fuels may be produced via Fischer-Tropsch synthesis. Syngas may also be used to produce methanol which can be converted at high efficiency into gasoline and diesel for transport via Methanol to Gasoline (MTG) or Mobil Olefin to Gasoline Distillate (MOGD) processes. Alternatively fast pyrolysis directly gives a liquid at up to 75 weight per cent yield which can be used in engines and turbines for power production. The resultant liquid can be stored or transported and delivered to a large processing plant for gasification and synthesis of liquid transport fuels. This can be operated giving economies of scale that are difficult to achieve with gasification. A further incentive is the potential for production of chemicals from the resulting pyrolysis liquid for example levoglucosan (a glucose derivative). These types of chemical are currently not hugely valuable as they largely rival those sourced from refining fossil fuels but, being feedstocks for the chemical industry, their value would be expected to rise as fossil fuel resources diminish.

21. There is potential for hydrogen to be produced by refining the by-products of agriculture and forestry and in fact any type of biomass by gasification. This process is highly efficient and research is progressed to a level that large scale production would be possible given the correct economic climate and necessary infrastructure.[3]

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[1] Mortimer, N D, Cormack, P, Elsayed, M A, and Horne, R E (2003). *Evaluation of the comparative energy, global warming and socio-economic costs and benefits of biodiesel.* Final report from the research unit school of Environment and Development, Sheffield Hallam University for the Department for Environment, Food and Rural Affairs. Report No 20/1.

[2] Department of trade and industry (2005). *Best Practice Brochure: Co-Firing of Biomass* (Main Report). Report No COAL R287.

[3] Babu, S P (2004). *Biomass gasification for hydrogen production—Process description and research needs.* A report from the International Energy Agency Thermal Gasification Task Force.

22. There is considerable potential for strategic development of solid biofuel use for electricity but this makes long-term economic sense only where forestry residues are also used. Short rotation coppice (SRC) (or the use of giant grasses eg Miscanthus) may offer an element of security with Renewable Obligation Certificates (ROCs) and SRC planting grants encouraging SRC plantings in the short-term but discounted cash flow issues go against SRC. This is due to the high initial investment costs and harvesting four years after planting rather than regular yearly income associated with annual crops.

23. The production of biogas is not as conducive to efficient transport in the same way as biofuels considering current infrastructure. However, because it can be generated by any source of organic waste by a range of low to high tech conversion options over a variety of scales it is suitable for immediate consideration in micro-generation style options. Larger projects are unlikely to gain sufficient capital in the current investment climate in addition to compromising optimal carbon dioxide savings by sourcing material from wide catchment areas. In terms of emissions this approach makes use of gases which would otherwise escape from landfill and efficient use of the energy potential of waste, reducing carbon output when compared to incineration.

24. As terrestrial contributions are greatly limited by the finite area of land available under any scenario, it is essential that we do not ignore the potential of the marine environment as a source of biomass for methane production. Research by the Scottish Association for Marine Science (SAMS) has demonstrated that macroalgae may be cultivated easily, grow prolifically (increasing biomass by 10% per day under optimum conditions) and sequester carbon. In addition, the aquaculture of seaweeds reduces contribution to eutrophication of the seas (removing nitrogen from the water for growth) and therefore may be used to mitigate the effects of sewage effluent and industrial sources of nitrogenous waste such as those originating from fish aquaculture, contributing to the maintenance or improvement of biodiversity.

25. Research in the USA into anaerobic fermentation during 1977, showed that seaweed yielded methane at a higher efficiency by weight than any other source of biomass.[4] At the time, research was halted because the technology of aquaculture was not advanced enough to withstand offshore conditions and fossil fuel derived gas prices were sufficiently low to discount methane as a practical alternative. Since then, practices in the mariculture of seaweed have advanced significantly and the price of gas in the UK continues to rise as supplies are diminished. Scotland is home to over 90% of UK aquaculture by value and volume and the SAMS have developed methods to produce large volumes of seaweed. As well as using specially developed structures and techniques for the production of seaweed inshore, additional potential lies in coupling the development of this area of aquaculture with current and future offshore installations such as wind farms. These potentials have been illustrated by demonstration projects in Germany, showing that cultivation methods for appropriate seaweeds may be applied to coastal conditions typical of those locations used for offshore wind power generation.[5]

26. Essentially, research funding is needed to marry well developed marine culture skills with the latest developments in anaerobic digestion to test UK seaweed species for suitability in methane production. Only when there has been a complete investigation into the whole process from culture to methane production will the potential for this approach truly be measured. It is clear that the opportunity to expand the possibilities presented by bioenergy into the substantial marine resource governed by the UK should not be overlooked.

27. It is quite obvious that a roadmap of what research, development and deployment is happening and needed in the UK is critical in planning future strategy and determining the real potential for UK bioenergy.

How cost-effective are biomass and biofuels in comparison with other sources of renewable energy?

28. This will depend upon scale, agricultural practice, energy efficiency of process, utilisation of crop residues, transportation requirements and other parameters.

29. Biomass costs nearly twice as much as coal on an energy value basis. Conversion requires lower capital costs due to the relative absence of pollutants. The disperse nature of biomass means that small plants of typically up to 25MWe equivalent will be the maximum that can be built unless there is massive importation of biomass. That is why the direct liquefaction route of pyrolysis liquid production and transportation is so economically attractive.

30. At sufficiently large scales of operation (for example above 50 MWe equivalent) and sufficiently low biomass costs (for example below £30 per dry tonne), bio-electricity and transport fuels could be produced competitively.

31. Co-firing biomass (in a ratio of around 1:9 biomass to coal) in conventional coal burning power stations means power companies can sell the resulting power for a higher cost through the renewable obligation certificates scheme (ROCs).[6]

[4] http://www.oceansatlas.com/unatlas/uses/EnergyResources/Background/Biomass/B1.html

[5] Buck, B H, Buchholz, C M (2005). Response of offshore cultivated Laminaria saccharina to hydrodynamic forcing in the North Sea. *Aquaculture,* 250: 674–691.

[6] http://www.forestmachinejournal.com/articles/Drax.pdf

32. Production costs for biodiesel are around 30–40p/litre (depending on scale of production) and are a little less for bioethanol but only at large scale production levels. The 20p/litre excise duty relief is key to their success. The economy of scale is an important factor in comparing the potential of biodiesel and bioethanol as the energy needed to refine bioethanol is higher than that of biodiesel. This arises from the fact that bioethanol from fermentation is a dilute solution of alcohol in water. To remove this water requires heating in the process of distillation. This offers a significant opportunity for scientists and engineers to develop energy efficient processes (such as pervaporation membranes) that could significantly reduce the energy required in this process.[7]

33. The use of biomass for energy is most efficient where the source of fuel and the demands are within economically viable distances of each other. In the Scottish example, 80% of energy needs are attributed to the supply of heat and transport fuel, roles that the products of anaerobic seaweed digestion at numerous locally based centres may part fulfil in coastal communities.

34. It is important to consider that "cost-effective" cannot be the main criterion before the facts are well established. Once the technology is viable, completely different cost equations will arise.

How do biofuels compare to other renewables, and with conventional fossil fuels, in terms of carbon savings over their full life-cycle?

35. In general CO_2 emission can be lowered considerably as CO_2 released on combustion should equal the CO_2 fixed as during plant or algae growth. However, this depends crucially upon:

- Energy of the process to convert biomass to biofuel, ie the more energy intensive the process (assuming energy derived from fossil fuel) the greater the CO_2 emitted over the lifecycle of the biofuel. The biggest contributor to the high carbon balance is the fertiliser assumed to be needed for production of biomass.[7] However, this is not applicable in the case of seaweed aquaculture.
- Transportation. The further a feedstock or biofuel has to travel (assuming that transport is using conventional fossil fuels), the greater the quantity of CO_2 emitted across the lifecycle. It is worth noting here that in comparison to other renewable sources including wind where the source of generation is effectively at site, in the case of biofuels the source must be delivered and stored from a site of production. Counter to this, sustained supply of biofuels to generation plants negates the issues of intermittency faced by such environmentally relient sources and bolsters security of supply. Aquaculture in conjunction with offshore wind installations could reduce the transportation element of the carbon balance during the production of seaweed as biomass.
- There is a significant opportunity for the chemical and biochemical sciences and engineering to make significant positive impacts within biofuel synthesis in terms of reducing energy and time, increasing yield, improving quality and reducing cost. Therefore there is a need to support the underpinning R&D science base.

36. Currently, different studies give different results and much depends on the Scoping and Systems Boundaries used for comparative Life Cycle Assessments (LCAs) of fossil versus biofuels. In terms of Carbon savings, assumptions made on the credits given for the by-products (rape-meal, glycerol, straw for biodiesel; distiller's dried grain with solubles (DDGS) and straw for bioethanol) have major impacts on conclusions.

37. The assumption should be that CO_2 produced from recycled carbon is different from CO_2 released from sources hitherto long term stored.

Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?

38. Best practice guidelines for farmers with a specific focus on minimising energy and costs would be an excellent starting point. The National Non-Food Crops Centre (NNFCC) and the many other centres of excellence such as Rothamsted Research, The Institute of Grassland and Environment Research (IGER) and the University of Southampton are well positioned to coordinate such an activity (with appropriate funding). A second point of note is that where feasible, by-products of biofuel production (eg wheat straw or sugar beet pulp) should be made into co-products or burned in order to maximise the energy efficiency of the system and offset costs. A third key point is to optimise the production of fuels and chemicals using concepts of biorefineries. The biorefinery approach is one in which the current petrochemical method of refining crude oil is applied to biomass, for example wheat, to produce fuel and additional chemical products and so optimising crop use.

39. Whilst it is technically possible to improve the energy balance of a crop, this would be difficult to enforce and is probably best left to the market. For example, urea as a source of nitrogen is cheaper than ammonium nitrate. However, the former is energy intensive in its production compared to the latter.

[7] http://www.eere.energy.gov/biomass/net—energy—balance.html

40. Similarly, it is important to realise that for bioethanol production only 20% of the energy inputs occur on farm—approaching 80% relate to the manufacturing process. In contrast, biodiesel requires a lower energy input during manufacture. Although, as discussed earlier in the case of bioethanol, the potential to reduce the energy of the process should be seen as a challenge to scientists and engineers.

41. There should be development of the best of the options in bioenergy available known now with proper R&D programmes for others. The production of seaweed, for example, has the potential to not only assimilate eutroficating nutrients from industry, agriculture and sewage effluents, but also contribute to the sustainability of other marine activities including the aquaculture of fauna which are sources of excess nutrients, primarily nitrogen. This is in addition to sequestering carbon as they grow.

What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and biofuels?

42. Both the Biofuels Directive and the Renewables Obligation should be powerful tools for increasing the demand for biomass and biofuels. However, to catalyse UK based biomass and biofuel industry, local production must be favoured over importing significant quantities of biomass and biofuels from abroad. Legislation and policy tools offer an opportunity to encourage best practice in biomass and biofuel production and should encourage practices that minimise energy requirements, cost and environmental impact. Legislation could also be applied in promoting the use of biomass co-products (such as wheat straw) to be used as a means of generating bioenergy and biofuels; the use of such co-products would reduce the need for planting specific energy crops. A successful and long term Emissions Trading Scheme would be an economic driver for companies offering energy with significant CO_2 reductions.

43. Underpinning this is the fact that however extensive the support measures and disincentives for fossil energy, industry will only adopt and implement these new technologies if there is a clear commercial and financial case for investment.

44. Government changes to excise duties and other financial mechanisms have a huge impact on production of biofuels. In the case of biomass production for generation, there are no immediate perceived financial incentives in comparison to those made available to nuclear or wind powered generation.

What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?

45. Long-term, cross Governmental consensus on UK energy policy is required that defines clear targets for bioenergy within a clear regulatory and incentive framework. A UK bioenergy industry can only thrive if such a long-term framework is in place (this applies across the board in terms of energy policy).

46. The current situation is that the amount of support is fairly attractive to investment, but the duration is insufficient for long term investment eg Renewable Obligation Certificates (ROCs) have a limited life that is considered insufficient for larger investments. There is also particularly high risk aversion (compared to countries such as the USA for example) in the UK which makes venture capital particularly expensive and makes companies reluctant to invest.

47. Currently there is little incentive for private investment in R&D relating to the potential relating to bioenergy so for governmental targets to be met in this area; this must be addressed. To reverse this trend a number of steps could be considered including progressing government schemes to applicable, end-product phases; the promotion of private-public partnerships at all stages of the process especially among companies currently reliant upon fossil fuels; the creation of a competitive environment for biofuel research via appropriate policy and economic mechanisms.

48. For example, on the basis of energy yield per hectare, woody biomass as a fuel for heat and power is much better than biodiesel. However, this crop has not developed because, unlike biodiesel, there is no existing supply chain of the sort found in France, Germany and Italy. It's difficult for the supply chain to develop because it requires small producers to form into cooperatives or other organisations which are large enough to deal with large customers, primarily the power companies. The stimulation of partnerships between the agricultural and energy sectors would clearly aid progress in this area.

49. In the area of marine aquaculture, immediate investment in researching the potentials of inshore and offshore resources as a source of bioenergy at appropriate scales would do much to open up the debate past the limitations of terrestrial production. In the future, provision of robust law and rights governing co-management of dual use areas of marine estate will be necessary in enabling best use of productive positioning.[8]

[8] Buck, B H, Krause, G, Rosenthal, H (2004). *Extensive open ocean aquaculture development within wind farms in Germany: the prospect of offshore co-management and legal constraints,* Ocean & Coastal Management, 47(3–4), 95–122.

What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?

50. This depends on what you grow and how you grow it. Any change in agricultural practice will undoubtedly have an impact upon biodiversity in some respect and it is important that we understand the implications of such changes as part of decision making processes. Again, it is important to stress the potential of agricultural and forestry co-products for bioenergy production (eg bioethanol from lignocellulosic biomass and all the other conversion technologies). Best practice guidelines for growing and processing bioenergy crops would be a valuable tool in reducing environmental impact by maximising product use.

51. Increasing wheat and oilseeds for liquid biofuels will have limited impact on biodiversity and on balance is likely to be detrimental if set-aside land is lost. SRC in contrast has very positive impacts on flora and fauna. The three year cutting cycle presents canopies of differing heights encouraging different ecosystems for each of the three years.

52. In considering the possibility of cultivating crops under an SRC regime, there are a number of disadvantages. Unlike arable crops (including non-food crops), SRC incurs establishment costs in the first two years and no output until year four. Establishment costs must therefore be subsidised to enable the aversion of cashflow implications. SRC has a triennial harvesting pattern rather than annual with knock-on effects to producers. In addition, the costs of removing SRC and reverting the land back to agricultural production are considerable. This means that under the current market influences, SRC is unlikely to be grown on land other than that required by the EU to be set-aside which ensures that income exceeds the cost of production.

Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?

53. Importing biomass needs to be carefully balanced from both an environmental and economic perspective. Biomass usually, but not always, contains a significant proportion of water and therefore transportation costs (in terms of both money and fuel) essentially relate to transporting that water. Again, it is important to stress that the CO_2 balance of bioenergy sources can be tipped in an unfavourable direction through poor supply chain management and high levels of fertiliser application. Importing completed biofuels such as bioethanol and biodiesel, may be feasible as the energy density of such materials is much greater and therefore transportation is less critical on the CO_2 balance. However, if we become reliant upon imported biofuels then there is an issue over security of supply, the situation in which we currently find ourselves regarding fossil fuels. In summary, it is sensible to minimise the distance a source of bioenergy has to travel throughout its supply chain, therefore local production is favourable. This means that small scale conversion plants will tend to dominate which has an adverse impact on economics of scale and costs of biofuels. The merits of a biorefinery approach to biomass utilisation may offer some mitigation to the high costs of bioenergy products through production of added value chemicals.

54. The best and most profitable non-food crops are those which provide products which through their functionality, environmental impact, health inputs and cost, will replace petrochemical products eg vegetable oils as lubricants or surfactants etc. When this is applied to bioenergy crops, the potential to fulfil other collateral needs must be considered. These roles may encompass the growing of bioenergy crops in areas unsuitable for alternative use including saline, dry or polluted conditions and the possibility of deriving high-value pharmaceuticals from said crops. Currently the Worlds total production of all biological oils and fats is no more than 20% of the 600 million tonnes of diesel used annually in road transport alone. In this scenario it is best left to the market to decide on comparative use of land for non-food crops for fuels or for other industrial uses. However, ethical conflict issues over (1) provision of land for non-food crops in a world with a growing population (2) the destruction of virgin areas of habitat for bioenergy provision should not be disregarded in discussions on bioenergy imports.

What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?

55. Much can be done to make more efficient use of by-products of agriculture and forestry. A few examples are cited below:

- Burn residues in dedicated biomass CHP plants for both electricity and heat generation (either for industrial or housing projects).
- Co-fire residues that are grown in close proximity to coal fired power stations.
- Gasification of residues to make either fuel gas (eg Hydrogen) or syngas (which can be used to make hydrocarbons, methanol and other fuels).
- Pyrolysis of residues to make either bio-crude, charcoal or syngas.
- Chemical or biochemical production of renewable bulk and speciality chemicals to increase the overall value of the system through biorefineries.

In addition, longer term availability of ROCs would help for example in allowing companies to plan long term investment options.

56. The biogas route deserves serious investigation, development, and consideration, keeping in view the potential to return the residue with nutrients, to fertilise the crop. It would be useful to quantify the amount of methane likely to be produced from deliberate "capture" schemes, compared with what is continually being produced by ongoing biological processes.

What lessons can be learned from other countries' experience in the production and use of bioenergy?

57. We can use the examples of other countries in the drafting of best practice guidelines for the growing, processing and use of biomass and biofuels. It is of course important that such guidelines are relevant to the conditions and situation of the UK. Widespread participation in the international R&D programmes such as the IEA Bioenergy organisation,[9] which receives UK and EC funding, will help to exploit these opportunities. The DTI Global Watch programme has already operated at least three missions on bioenergy to improve knowledge and technology transfer. The DTI has also organised trade missions to other countries to promote bioenergy in the UK.

58. Biodiesel has developed as a transport fuel purely because the supply chain, as for food oils, was already in place. It has suited France, Germany and Italy to promote biodiesel because it can supplement agricultural incomes in a way which is legitimate under CAP. Were it not for these aspects, biodiesel would not have developed. Research into these supply chains and how the UK could implement them would be worth considering. An additional source of bioenergy is being explored via current programmes operational in Sweden[10] that utilise industrial waste from livestock processing to produce biogas for transport and heat. In addition there is opportunity to use such wastes in co-firing power stations, however current UK legislation pertaining to health risks prevent such options.[11]

59. We should not over-estimate the potential to produce energy crops. Land is the major limiting resource and bioenergy should be seen as only part of a renewable policy that involves use of wastes, wind, wave, solar and other renewables combined with commitment to international research into future technologies including the ITER project due to begin operation in 2016. These steps should be taken in addition a concerted effort to improve user efficiency.

Openness

60. The Biosciences Federation is pleased for this response to be publicly available and will be shortly placing a version on www.bsf.ac.uk.

Key contributors

Professor Sir Tom Blundell of the Department of Biochemistry, University of Cambridge.

Professor Tony Bridgwater of the Bio-Energy Research Group at Aston University.

Professor Roland Clift of the Centre for Environmental Strategy, University of Surrey.

Dr Jeff Hardy, Manager of the Environment, Sustainability and Energy forum at the Royal Society of Chemistry.

Dr Maeve Kelly of the Scottish Association for Marine Science.

Dr Kerr Walker and Professor Dale Walters of the crop and soil research group, Scottish Agricultural College.

Dr Brian Wood, Institute of Biology

Biosciences Federation and the Royal Society of Chemistry

February 2006

APPENDIX

Member Societies of the Biosciences Federation

Association for the Study of Animal Behaviour	Experimental Psychology Society
Biochemical Society	Genetics Society
British Andrology Society	Heads of University Biological Sciences
British Association for Psychopharmacology	Heads of University Centres for Biomedical Science

[9] http://www.ieabioenergy.com/IEABioenergy.php

[10] http://www.svenskbiogas.se/

[11] House of Lords Science and Technology Committee (2004). *Renewable Energy: Practicalities, Volume 1:* Report. Box 5: Chicken litter vs chicken feathers, p 35.

British Biophysical Society
British Ecological Society
British Lichen Society
British Mycological Society
British Neuroscience Association
British Pharmacological Society
British Phycological Society
British Society of Animal Science
British Society for Cell Biology
British Society for Developmental Biology
British Society for Immunology
British Society for Medical Mycology
British Society for Neuroendocrinology
British Society for Proteome Research
British Toxicological Society
Institute of Animal Technology
Institute of Biology
Institute of Horticulture
Laboratory Animal Science Association
Linnean Society
Nutrition Society
Physiological Society
Royal Microscopical Society
Society for Applied Microbiology
Society for Endocrinology
Society for Experimental Biology
Society for General Microbiology
Society for Reproduction and Fertility
Universities Bioscience Managers Association
UK Environmental Mutagen Society

Additional Societies represented by the Institute of Biology

Anatomical Society of Great Britain & Ireland
Association for Radiation Research
Association of Applied Biologists
Association of Clinical Embryologists
Association of Clinical Microbiologists
Association of Veterinary Teachers and Research Workers
British Association for Cancer Research
British Association for Lung Research
British Association for Tissue Banking
British Biophysical Society
British Crop Production Council
British Grassland Society
British Inflammation Research Association
British Marine Life Study Society
British Microcirculation Society
British Society for Ecological Medicine
British Society for Parasitology
British Society for Plant Pathology
British Society for Research on Ageing
British Society of Soil Science
Fisheries Society of the British Isles
Freshwater Biological Association
Galton Institute
Institute of Trichologists
International Association for Plant Tissue Culture & Biotechnology
International Biodeterioration and Biodegradation Society
International Biometric Society
International Society for Applied Ethology
Marine Biological Association of the UK
Primate Society of Great Britain
PSI—Statisticians in the Pharmaceutical Industry
Royal Entomological Society
Royal Zoological Society of Scotland
Scottish Association for Marine Science
Society for Anaerobic Microbiology
Society for Low Temperature Biology
Society for the Study of Human Biology
Society of Academic & Research Surgery
Society of Cosmetic Scientists
Society of Pharmaceutical Medicine
UK Registry of Canine Behaviourists
Universities Federation for Animal Welfare

Additional Societies represented by the Linnean Society

Botanical Society of the British Isles
Systematics Association

Witnesses: **Dr Rebecca Rowe**, Plant and Environment Laboratory, School of Biological Sciences, University of Southampton, **Professor Tony Bridgwater**, Bioenergy Research Group, Aston University, Royal Society of Chemistry and **Dr Jeremy Woods**, Imperial College Centre for Environmental Policy and Technology, Royal Society of Chemistry, gave evidence.

Q202 Chairman: Good afternoon ladies and gentlemen. Welcome to a further evidence session on the Committee's inquiry into matters connected with biofuels. May I welcome at the outset representatives from the Biosciences Federation and the Royal Society of Chemistry. Dr Rebecca Rowe from the Plant and Environment Laboratory, the School of Biological Sciences at the University of Southampton, you are very welcome. Professor Tony Bridgwater from the Bioenergy Research Group at Aston University, also representing the Royal Society of Chemistry and Dr Jeremy Woods, who has been a friend and helpmate already to the Committee in these matters, from Imperial College Centre for Environmental Policy and Technology and also representing the Royal Society of Chemistry. We had hoped to be joined this afternoon by Dr Maeve Kelly from the Scottish Association for Marine Sciences, but sadly Dr Kelly has had to attend a funeral and we fully appreciate why she is not able to join us this afternoon. I gather, Professor Bridgwater, that on those areas where she was going to talk to us, particularly about biomass in the marine environment, you are fully up to speed on these matters and you will be able to accept questions from the Committee; for that we are very grateful indeed and we look forward to getting to that part of our activities. I should like to start by just trying to put policy into context, take your views about that and the way the Government have arranged the deckchairs on the whole question of bioenergy. Last week, we heard from the Biomass Task Force and I started my approach by drawing everybody's attention to an annex at the conclusion of the Biomass Task Force report which was two pages of schemes and initiatives sponsored by different bits of government trying to promote the use of biomass. I said at the time that I thought this looked rather bitty and it lacked coherence. I suppose when one looks at some of the other areas of bioenergy, one might level the same accusation at it, bearing in mind the number of departments which are involved and the sometimes oft quoted criticism of a lack of coherence of joining up when it comes to the use of bioenergy. I wondered whether, from your standpoint, you might have formed a similar view.
Professor Bridgwater: It is true that the whole bioenergy system is a chain, starting with the planting of biomass, the growing, the harvesting, the transport, the conversion into higher value products and their utilisation in energy systems and you have therefore three government departments involved. One of the omissions or weaknesses of the whole system is consideration of the interfaces between the component parts of the chain. It is improving, but there is still a significant gap there.

Q203 Chairman: How would you see it improved?
Professor Bridgwater: By the support being given to the interfaces and by the relevant departments working more closely together to ensure that the bits are all joined up more coherently.

Q204 Chairman: Dr Rowe you are nodding; your body language suggested you agreed with my line of questioning. What are your observations on this?
Dr Rowe: I have to agree with Professor Bridgwater that we do need a more coherent policy. My experience is more with the farmers and the growers and from their experience, although there is obviously the funding for the initial planting of biofuel crops and crops like *Miscanthus,* they still have to wait then for four years and most of that money is taken in the establishment of the crop. They do not get a yearly income, so there is that missing and it would be helpful for them if the money were more spread out maybe. Then they also need to make sure they have a contract with somebody to take this off them afterwards. There is a need for groups to come together to form companies which can then supply, for example, power stations and if we are talking about wheat, you need a large quantity in a small place so you need companies to come together to do that and I feel that there is a gap there as well.

Q205 Chairman: Do you as a group sense that the Government is fully committed to developing the UK biofuels industry?
Dr Woods: The question to me is most clearly written in terms of the time horizons of policy. That is what emerges time and time again when you talk to industry or when you talk to any of the other sectors. The RTFO time horizon is far too short; that is pretty clear. It will not bring in industry or if it does, it will bring in half-hearted industrial involvement. It is equally true in the research and development sector that that is the case. You are absolutely right that there is not yet a cohesive strategy.

Q206 Chairman: Just to bring this opening line of questioning to a conclusion, following on your observations Professor Bridgwater, are there any particular recommendations that you think the Committee should be aware of where you think there are problems? You were talking about improving the interfaces. What kind of things practically could be done in your judgment to address those issues?
Professor Bridgwater: The timescale, as has just been mentioned, in that industry needs to have long-term security of funding support to encourage them to invest. They often look at a 20-year horizon: five years for planning and construction, 15 years for operation to give an adequate return on investment. In a number of areas like co-firing, for example, this is extremely successful, but there is a great reluctance to invest in major plant because of the lack of assurances over the investment for that. The second area that is important on the investment side is the gap between the successful research development and demonstration and the commercialisation. There is a great risk averseness by venture capitalists and industry and purchasers and there is what we

call the "valley of death" between a successful demonstration of a technology, including the production and the conversion utilisation and its commercial implementation. More support might be given to helping that, so that we can overcome this black hole or this "valley of death".

Q207 Patrick Hall: In your collective evidence, paragraph 2 in the executive summary, you say "Carbon savings would be greater in electricity production than in biofuels and so provision of land for this would exemplify 'best use'".[1] This is presumably referring to electricity production. In terms of tackling climate change, why should we be producing biofuels at all?

Professor Bridgwater: May I ask what biofuels means to each of you? Different sectors of the community do have a different understanding of what a biofuel is. To some people, it is the raw biomass produced, to some people it infers liquid transport fuels. I should find it helpful if you could define what you mean exactly by a biofuel?

Q208 Patrick Hall: No, I am going to ask you what you meant by biofuels in your evidence because I have read out your evidence and you refer to biofuels in that.

Professor Bridgwater: Biofuels is conventionally represented by the liquid transport fuels for use in the transport sector. It is sometimes used also to refer to the primary product produced by the biomass industry and I just thought it was helpful to clarify that. The biodiesel industry is very successful at the moment. There are five or six major plants either built or under construction but the biodiesel product can be assimilated only up to a certain level without detracting from the performance guarantees given by the engine manufacturers. Bioethanol is another biofuel, transport fuel, which is also limited in its usage because of vapour pressure considerations in the distribution, handling, filling and utilisation in engines. There is also the question of compatibility between different companies who are producing conventional transport fuels, because you cannot have one company adding, say, 5% and another company not adding it because most of the transport fuels are pooled. There is a problem with compatibility between different producers in different parts of the country and different standards for biofuels. The alternative in fact, rather than looking at small percentage additives, is to synthesise entirely compatible conventional hydrocarbon fuels which is an alternative approach. You then not only get a much cleaner fuel, but you are also getting material which is totally compatible with the existing infrastructure and with the existing gas and diesel markets.

Q209 Patrick Hall: How does one do that? What are the raw materials for that?

Professor Bridgwater: You can take any biomass and you convert it into what is called synthesis gas, a mixture of hydrogen and carbon monoxide, and then this is turned into liquid fuels as in the Sasol plant in South Africa for example.

Q210 Patrick Hall: So trying to go back to your summary in your evidence where you say that electricity production is more compatible with tackling climate change effectively than biofuel production, one has to ask whether you are saying logically that the Renewable Transport Fuels Obligation is worthless and that we should not be producing biofuels in the transport sense in this country?

Professor Bridgwater: It satisfied the short-term requirement to get the industry to accept different fuels and have them accepted by the users in the marketplace. In the longer term, if you are looking at achieving more than a 5% substitution, then there are potential problems with the vehicle manufacturers as to how they can accommodate that. So it is more of a short- to medium-term solution than a long-term solution because of the limitations and the extent of the blending.

Q211 Patrick Hall: But you are saying that any percentage presumably is not as effective a way of reducing carbon emissions as electricity production? So any use in transport is not as effective. If we are looking at this from a global point of view, we should not be going down this road. Is that a conclusion that I can draw from your evidence?

Professor Bridgwater: I do not believe that is a valid conclusion. The opportunity to produce transport fuels addresses the environmental issues and also addresses the security of supply issues. Biomass is unique in that it is the only way of fixing carbon which we need for many commodities like conventional transport fuels and many chemicals. There are no other ways of producing that carbon resource in a renewable way. Therefore the optimum use of biomass needs to utilise that fixation of carbon from the atmosphere into a useful valuable resource. It is a question of economics, the commercial economics of what is the most attractive way of using the resources that we have.

Q212 Patrick Hall: I can see that Dr Woods wants to come in here and possibly Dr Rowe.

Dr Woods: There is an interesting perspective on this which is that it is too early yet to talk about the optimum allocation of land for biomass for energy. We have a short term, perhaps the next 10 or 15 years, where we have to address the transport sector and clearly biofuels are the only game in town at the moment for doing that. If you take that decision or that logical pathway, then you have to ask what the best biofuels option is for that. It is obvious that biofuels can be done very well or very badly and very badly means worse than conventional gasoline and very well means some very substantial gains. You can get well below 100 grams of CO_2 per kilometre if you are talking about higher blends. Again you have to talk about the whole chain and the whole

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system within that perspective. To come back to the fundamental of your question, it is really too early to start picking between the sectors and to say, yes, we should in effect abandon one of the sectors in preference for the other. There is a lot of innovation to play in this area.

Patrick Hall: That is nonetheless a conclusion you have come to in your evidence to us and if that is your best assessment now, surely it is absolutely relevant to pursue this line of questioning at this stage. If we are going down the wrong road, if that is your conclusion at this stage, that this country should not go down that road and instead should go down another one, then this is the time to say it and to say it loud and clear.

Lynne Jones: We have been told by the NFU that we can meet the Renewable Fuels Obligation for transport with all the spare land that there is, with the exported wheat and with the set-aside land, but why should we be allow the fuel obligations to dominate the biomass, the biofuels sector, given your conclusion?

Q213 Chairman: In paragraph 19 of your evidence, you draw our attention to the fact that "Electricity or heat from short rotation coppice provides between three and six times the CO_2 reduction per pound that can be obtained from rape methyl ester . . . or bioethanol from cereal crops". In paragraph four, you indicate the land area which could meet the road transport fuels requirement, bearing in mind there is a finite amount of land which appears to be available for growing these crops. What my colleagues are trying to explore with you is where the investment should go at this stage because you, in your opening remarks, talked about the need for certainty and longevity of decision making. Do you spread your investment pounds very thinly on all kinds of runners and riders in the bio race or do you concentrate it where you are going to get the best bang for the buck in terms of CO_2 saving? That is what we are trying to get your guidance on.

Dr Rowe: The main point we are trying to make is that you have two options basically for making biofuels, if you wish to go down the biofuel line. We have already made agreements with the EU that we are going to do the 5%, which has advantages as well as it makes people aware of the fact that there is already an issue; it makes the public aware, so there is a public awareness factor to it as well which you must not rule out completely. The point is that rather than using cereal grain there is the option of using biomass products and that would mean *Miscanthus* or even the actual waste products from cereal production, through the straw, through a separate process to make bioethanol. That is actually possible and that process is being developed. I am not an expert on how good that process is currently, but the idea is that that process may be more efficient than using cereal grain. That is mainly the statement they were discussing in those paragraphs.

Q214 Chairman: With respect, that does not quite answer the question that colleagues were posing. The colleagues were posing the question about where we get the best return. If we are going into biofuels in the widest sense of the definition of that, do we focus it on heat and use all the land to produce things we can burn or do we focus it on the production of liquid fuels or do we wait until there are more advanced technologies around the corner where we can fractionate a particular plant into food, into cellulose, into whatever? We are trying to get a feel as to where the investment should be.

Dr Woods: I agree it sounds confused in the approach and I have to say I have come in late to the process so I have only just recently read the evidence that was submitted. There is a difference in issue here. There is an issue where you could come at this with the perspective that we have the UK land area and we have X amount of pounds to invest in that land area and we shall have a maximum perfectly efficient policy which is going to allocate that land to the least cost carbon abatement option. That is a false view. First of all, we do not have in essence perfect knowledge on the best bioenergy options available and secondly, you cannot cherry-pick the sectors in that sense. Then, if you step back from that and say perhaps government policy could leverage more investment in certain areas, it is very true that the biofuels sector offers the most opportunity for levering private sector investment. Secondly, does that mean that you should say right, then the electricity and heat sectors are not as relevant or important? That would be a false option to take at the moment as well. I am afraid that if you were looking for a kind of academic purity and clarity in that approach, you are not going to get it from us.

Q215 Patrick Hall: Okay; it is just that your evidence does say that electricity production is the most effective way of reducing carbon emissions. May I then accept that you accept the Renewable Transport Fuels Obligation and the target of 5% by 2010, leaving aside what we have just tried to explore? Would you accept the logic that once we have that target, and let us assume we reach it, that there will be pressure to say that we have produced this much, now we go on to produce more? Then, if we look at your first paragraph in your evidence, in the executive summary, you say "UK capacity to produce biofuels . . . is limited to 5–10% of the total road transport fuel requirement without changes in the production of food crops but with use of exports and set-aside land". If we do go beyond the 5% and perhaps indeed beyond the 10%, what do you think at this stage the effects would be on UK food production, on biomass crops for heat, for electricity and indeed land use? Just a broad view of that position, because you are looking at these matters right now, because it is in your evidence.

Professor Bridgwater: I want firstly to confirm what Jeremy has just been saying about the wrongness of picking winners now. There is still a lot of development to be undertaken, particularly on the

liquid biofuels, developments concerned with performance, selectivity and costs and it would be unwise to abandon one area and pick another area.

Q216 Patrick Hall: Excuse me, but I do not know who is talking about abandoning one area in favour of another at this stage. If there are any implications that lead to that, they come from your evidence. I should like to move on from that to the question that I just posed rather than the previous question. So would you address the question I have just posed? If we do go beyond the 5% and possibly the 10%, what would be the knock-on effects on UK food production and land use?
Professor Bridgwater: I am afraid I am not an expert in land use or food production. I do not know whether either of you are able to comment on that.
Dr Woods: It is very clear that if you wanted to produce more than the 10% of current land transport use, you would need substantial amounts of land, especially given current technologies. It would impact on land use; there is no doubt about it. Then the detail of that is, if you want to expand biodiesel production substantially and it is all done through rape seed, how that fits within the rotational cycles. I would bow to the NFU knowledge on that sector, but it is true that it will impact on food production in that sense. A more interesting question is: given the UK's approach in terms of fuel security rather than food self-sufficiency, does it really matter? You could take it to its extreme and say right, well let us produce very large proportions of our transport fuels or our electricity and heat from bioenergy and not produce any food and the knock-on effect of that would be that we would buy it all from abroad and then the question is what impact that would have on world food prices and that is a very complicated question. It is one that we are seeing being played out at the moment in terms of the Brazilian sugar and ethanol interchange. The reason that the sugar price is at an all-time high and the reason that the ethanol price is at an all-time high is because the Brazilians are now the producers of both and not able to produce enough of both to keep the prices as they were before, plus the impact of the sugar reform that is going on at the moment. There are some very complex economic interactions which are likely to emerge and I cannot say that I can predict what the outcomes are going to be.

Q217 Patrick Hall: No, but we are embarked upon a process and a direction and we need to question the possible implications and outcomes of that in the future. Of course the imperative is to tackle climate change and I am now not so sure whether the direction that we are embarked upon is the most effective in order to reduce carbon production in this country. I shall leave it at that.
Dr Woods: That is a shame.
Patrick Hall: I was not trying to stop a reply, I was just saying I had finished.

Q218 Chairman: Say what you want Dr Woods. We do not cut off good answers.
Dr Woods: I was asking why you had reached that conclusion. You seemed to be implying that the biofuel option was not a method for addressing climate change options in the UK as a result of what you have heard from us.

Q219 Patrick Hall: Because you say that carbon savings would be greater in electricity production than in biofuels. Because the evidence says that, I am coming back to that because it is an important statement which you have made which may suggest that we should, as a country, be thinking very carefully about the Renewable Transport Fuels Obligation.
Dr Woods: But you have to have a view of this over time periods and the scales of the markets. If you are talking about a ten-year period from now, so talking about a 2015 target, then you can say that yes, having a five to 10% inclusion of biofuels, if it is done well, and that is the point I was trying to make, if the target is CO_2 reduction and policy incentivises CO_2 reduction so the best biofuels are produced, then they will have a substantial impact, even at 10%, on greenhouse gas reduction targets. Equally, that will have used a certain proportion of the land and a certain amount of the biomass accruing on UK land area. That does not exclude, in that period, a substantial amount of biomass going to electricity, co-firing and to heat. That is the real point: at the moment we are not anywhere near the limits of the resources. We can know that in a period of time. What is really important is that policy sets out very clearly and incentivises carbon reduction, for example, and at the moment it does not do that: the RTFO does not do that, the ROCs do not do that and the signals are too short term in that sense.
Chairman: We might come back to seek your advice as to what the signals should be, possibly in addition to what Professor Bridgwater was saying earlier about long-term signals.

Q220 Mrs Moon: My questions were really for Dr Kelly, so I am sorry if you are going to have to pick these up Professor Bridgwater. We move off land use and we move into marine biomass. The picture that is painted by the evidence that we have received is that it is wonderful that there is a crop that can grow by 10% a day, a crop which can have a wonderful effect on biodiversity, not just tackle CO_2 issues but take nitrogen from sea water; it sounds wonderful. But what is the reality? How far away are we actually from the commercially viable use of seaweed as a source of bioenergy?
Professor Bridgwater: It is perhaps valuable to note that seaweed is already used commercially for making chemicals like alginates, so there is an established industry which knows how to grow and harvest and process it. For the mass production of biomass which is sufficiently low cost to be commercially viable it requires a great deal of development work, understanding about the viability of growing and harvesting and transport. That is an area which needs to be addressed but potentially is clearly enormous; the opportunity is there and we are not limited by the land resources we

have that we have just been discussing. Certainly there is enormous potential there, but there are significant challenges for the harvesting and the transport and the subsequent processing, just to go back to what I said at the beginning about the importance of looking at the interface between the production and utilisation. One of the challenges is the composition, like the chlorine inevitably rising from sea water and the handling of large quantities of very wet biomass. They are not insuperable, but this has to be done to address the challenges of how to harvest and how to handle and transport and utilise. That is one of the areas which deserve a lot of support.

Q221 Mrs Moon: My problem with that is, having looked at some of the figures from Japan and the United States, that they are talking about a figure of £2.8 billion to do that developmental work you have talked about in Japan and they are talking about £20 million in the States; that was back in 1986 and that figure has gone off the Richter scale in 2006. What level of funding are we talking about to do this developmental work? Would it in fact ultimately be a distraction from the issues that Mr Hall has just been talking about in terms of the land use and development going down that route?
Professor Bridgwater: You are aware I am not an expert in marine biomass, I am not an expert in biomass production. I am much more involved in the conversion and the interfaces before and after. The opportunities with the UK having such a long coastline and the expertise already there, both in terms of fish and the algae harvesting and processing, would justify a serious investment to look into what would be needed to establish a system to harvest and process kelp or algae. But what the cost might be . . .? I should have thought one could have got a reasonable feeling for what would be needed in a £5 to £10 million study. That is just a pure guess.

Q222 Mrs Moon: So we are working on guestimates rather than an actually worked-out plan and programme.
Professor Bridgwater: I am not aware of any research that has been done into looking at the system aspect of harvesting algae in large quantities, handling it, transporting it and processing it. I am sorry, I am not as well informed in this area as I might be and I am sure we can pass on lots of the questions to Dr Kelly. My guess is that it is an exciting resource because it breaks free of the land barriers we have just been discussing, but there is remarkably little known about what a system might look like to handle it, harvest it, transport it and process it.
Mrs Moon: Chairman, may I suggest that these really are Dr Kelly's specific areas of expertise. Could we submit those questions to her in writing?
Chairman: We shall certainly do that because I should like to add some practical questions: I do not know over what area of ocean, deep, shallow, you would have to plant, what kind of size this would be, ownership. One of the problems for example with lobster production is that people go out and seed lobsters, but to whom do lobsters belong? You put the input in but somebody else can come along and take the output. It would be very interesting to learn more about that. I have just been advised that Dr Kelly will be happy to receive further questions in writing, so we will delay our inquisitiveness to that.[2]
Lynne Jones: We also need to ask where this is going to be located and what the implications are for shipping lanes.
Chairman: Absolutely. Although we will be talking later in our discussions about land based biodiversity, I am sure there are some interesting marine-based biodiversity questions that will be raised by it as well. You can see we are champing at the bit to get at seaweed and kelp.

Q223 Lynne Jones: Before I move on to the specific area I wanted to ask questions about, your paragraph 27 says "It is quite obvious that a roadmap of what research, development and deployment is happening and needed in the UK is critical in planning future strategy and determining the real potential for UK bioenergy". That really is the crux of the matter in terms of what we have been talking about and perhaps you can go away from today and think about where we are at on that. For example, I have no ideas whether there are bids into research councils for funding for the sort of marine research which you were hinting at a few moments ago. It is also relevant to the earlier discussion in terms of the direction that we are going in. I was a bit concerned about what I thought was a lack of clear-headedness in your responses to Mr Hall's questions earlier. You had come to that conclusion and it does seem to me that the Government do need good scientific advice to help them develop effective policies and it all comes across as very muddled. For example, you have highlighted, and Dr Rowe has mentioned it, the lack of incentive for the production of short-rotation coppice, yet we know from your evidence and from other evidence that we have been given, that the carbon saving from developing that biomass is much greater than developing crops for the current generation of biofuels, yet all the policy steering now is going in terms of biofuels. To redress the balance we have the Biomass Task Force, but there is nothing there to address this issue about incentives to farmers for short-term coppicing. Whether you want to comment on that, I do not know.
Professor Bridgwater: The UK Energy Research Centre (UKERC) is currently carrying out a roadmap of the whole energy scene in the UK and many of the 12 SUPERGEN consortium are also doing a roadmap for their specialities funded by the research councils. There is actual work going on both with the SUPERGEN consortium and UKERC and between the UKERC and the SUPERGEN. That is ongoing and is recognised as extremely important and has been taken up by the

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consortium. That answers that point. The research community does recognise how important it is to provide a steer and to provide some advice.

Q224 Lynne Jones: Do you want to comment on the incentives for short rotation coppice?
Dr Rowe: As far as the policy goes, it is not an area I am hugely aware of. I know that at the moment a lot of planting is going on, for co-firing certainly; there are incentives there and people are planting these crops at the moment. Three thousand three hundred hectares are being de-cropped to supply them for co-firing, so there are incentives there. More work needs to be done, but there are some incentives already in place in that case.

Q225 Lynne Jones: A lot of this argument may hopefully be unnecessary in future, if we have the results of further research into second generation biofuels.
Dr Woods: This is an indication of what we mean by unclear policy. The ROCs policy with co-firing right now—and it is right that activity has been stimulated with short-rotation coppice with ROCs—and Drax is one of those which has been doing that. That is likely to come to a halt right now because the cap on ROCs that can come from crops is being reduced.

Q226 Lynne Jones: That is being reviewed, but the reason for that is because you will have all the ROCs for co-firing, which really is only a short-term benefit. It is still largely dependent upon coal power stations, which is not the way to go in the long term. Turning to the point about second generation fuels, even George Bush has mentioned cellulosic digestion and I understand in Germany they are putting a €500 million investment into alternative fuel technology research over the next 10 years. It does seem in this country that we are putting all our efforts into the current generation of biofuels when actually we would be better off if we put our effort into short-rotation coppice whilst we actually develop the kind of biofuels which can use that fraction of the biomass that is most efficiently used or cannot be used for other things. Where are we going? How soon can we expect to see commercially available second generation biofuels and what should we be doing to encourage that development as quickly as possible?
Professor Bridgwater: The problem is that the kind of size of plant currently considered commercially viable is around 15,000 barrels a day of liquid fuels and this requires the investment of between £1 and £2 billion. That is a very large investment for an industry to embark on with very poor appreciation of the policies which are going to be in place in 20 or 25 years' time. That is one of the problems, that the amount of investment needed to build plants of an economic scale is very, very considerable and the major energy companies, BP, Shell and so on, are probably reluctant to embark on investing in an industry which is reliant on subsidy to be viable without a clear idea how long that subsidy is going to become available for.

Q227 Lynne Jones: My point was about cellulosic biofuels.
Professor Bridgwater: This is from biomass to conventional hydrocarbon transport fuels.

Q228 Lynne Jones: When we were in California, for example, we met a company where they are developing enzymes for different purposes and I got the distinct impression we were not yet ready for commercial development; a lot of research still needs to be done. Is that a wrong impression?
Professor Bridgwater: The problem with the enzymatic hydrolysis of ligno-cellulosics is the cost of the enzymes. There has been a very concerted effort with three organisations in North America to try to bring the cost down, but they are still not economically competitive even in the USA with subsidies. The companies concerned are not building plants based on enzyme hydrolysis: it is driven by the economics. If companies are going to invest, it has to be economically attractive either with or without subsidies, and if it is based on subsidies, those subsidies need to be there sufficiently long for a profitable investment to be made.

Q229 Lynne Jones: So you are not suggesting that the research could result in much cheaper processes, you are suggesting that we have an expensive process.
Professor Bridgwater: The research is addressing mostly the cost of the enzymes and the technical improvement of the processes to give high yields at lower cost and that is ongoing, mostly in North America, also some in Sweden and Finland. I am not aware of any significant activity in the UK on biological conversion processes.

Q230 Lynne Jones: So should there be?
Professor Bridgwater: When there is a finite resource, do you spread it thinly or do you focus on the centres of excellence that we have already? My view is that you build on what you have, rather than spread the same resources out over a much wider scientific area in which you firstly have to build up the capability and provide the resources for the research to be done with no assurance you will ever catch up with the competition in North America and the rest of Europe.

Q231 Lynne Jones: So we leave it to the Americans and the Germans to develop what potentially is the only viable way to produce transport fuels which are not going to have high carbon emissions.
Professor Bridgwater: That is the way to produce ethanol, which is used as an additive in gasoline. If you want to produce a synthetic gasoline or diesel which is totally compatible and miscible in any proportions with the conventional hydrocarbon infrastructures, then you go down what is called the Fischer-Tropsch route like the Sasol plant in South Africa. That would give you an entirely compatible synthetic gasoline and diesel which you can use in any proportions in any vehicle anywhere in the world.

Q232 Lynne Jones: What are the raw materials for that process?
Professor Bridgwater: Biomass.

Q233 Lynne Jones: Biomass. So it is a biomass project?
Professor Bridgwater: It is a biomass-based process. If you are interested, half of the aviation fuel in South Africa comes from the Sasol process, which is based on coal, but could equally well be based on biomass.

Q234 Chairman: How would it be based on biomass?
Professor Bridgwater: You would gasify the biomass to form synthesis gas and then you would synthesise the carbon monoxide and hydrogen into diesel and gasoline.

Q235 Chairman: What would be your biomass feed stocks?
Professor Bridgwater: It could be any biomass. It could be agricultural waste, short-rotation coppice, energy crops, forest residues or anything.

Q236 Chairman: So the same materials which have been cited as inputs to a cellulosic approach could be the same for the one you have just described.
Professor Bridgwater: Indeed, with the advantage that all of the biomass is converted to synthesis gas, whereas in the enzyme or acid hydrolysis of ligno-cellulose, you have a significant waste stream of the lignin. You are actually not converting all of it; you are only converting maybe two thirds or three quarters at the most, in other words it improves the efficiency.

Q237 Chairman: Being simple souls, does that represent a good, next generation, best buy? What Ms Jones was trying to elicit from you, and I take the point that where there is a limited amount of investment people have to be able to see a return, but if you deduce that there is a technically established process, as you have described for the Sasol one in South Africa, which could work with a biomass input, if that gives you a better chance of producing the range of highly compatible fuels which you have just described—and interestingly one of the challenges that we have been debating is the question of how you address the aviation issue—it almost sounds to me as though you have found the nirvana of the future in telling us that that is the route we go down because we can tick the box biofuels to power planes, biofuels to power cars. You might walk out of here and say that is where the money should go.
Professor Bridgwater: Yes. Thank you.
Chairman: It is? Is that it? We have got there.

Q238 Lynne Jones: That brings me to the point about the relative carbon savings from gasification as opposed to the cellulosic enzymatic route. Can you answer that question? How do those two processes compare in terms of CO_2 emissions?
Professor Bridgwater: I do not have the data available. It can be made available, but what I have done is to look at the amount of transport fuel yield in energy terms per unit land area. If you go down the gasification to Fischer-Tropsch or fuel synthesis route, it is about double that for the ethanol route via acid hydrolysis or enzyme hydrolysis; it is twice as efficient, both in terms of the land use and in terms of the performance.

Q239 Lynne Jones: But you are talking about land use and energy, but not necessarily the same as—
Professor Bridgwater: I do not have those figures available. I can get them for you.

Q240 Lynne Jones: If there is anything. There is also production of hydrogen from these technologies as well and what needs to be done? Is that a way to go, to use these technologies for large-scale hydrogen production?
Professor Bridgwater: Hydrogen is one of the wonderful fuels of the future. From biomass you get about a 7 to 8% weight yield of hydrogen through thermal gasification and there is the alternative of biological gasification to produce hydrogen. The yield of hydrogen in weight terms is very small, but the energy content of hydrogen is extremely high. The problem with hydrogen also relates to how you store it, distribute it and market it. The great attraction, in the medium term at least, of conventional hydrocarbon fuels is that you have an established infrastructure for the distribution and handling of them. You do not have to develop a completely new system for distributing them, using them and storing them. Hydrogen is very attractive, it is very clean, but when you make hydrogen from biomass, you have to lose the carbon somewhere and the carbon comes out as CO_2. You could capture it in the way you can capture it from coal or fossil fuel processing or you can release it on the basis that it is carbon neutral anyway.

Q241 Lynne Jones: If you are producing it from biomass in an efficient way, then it should be as near carbon neutral as can be; that is the point of using biomass.
Professor Bridgwater: Absolutely, of course, but you could make it even better by capturing the CO_2 into the production of hydrogen, which gives you a credit.

Q242 Lynne Jones: So long as you can store it long term.
Dr Woods: It is a good way of actually physically extracting carbon from the atmosphere.

Q243 Lynne Jones: In terms of this physical infrastructure, that is being developed; we saw that in California, but it is very, very expensive.
Professor Bridgwater: Indeed.

Q244 Lynne Jones: Are you advocating that there should be mechanisms for infrastructure, for example public transport schemes?
Professor Bridgwater: If you have a dedicated distribution handling system, handled by experts who understand how dangerous hydrogen can be, that is fine. The idea of any of us walking into a

garage and filling up our cars with hydrogen at enormous pressures or liquid hydrogen is a very long way away, if at all.

Q245 Lynne Jones: Obviously this is in the realms of the future and we have a lot to do in the next 10 years or so.
Professor Bridgwater: Yes; indeed.

Q246 Chairman: A lot of food for thought there. Can you just explain one thing to me? I do not know whether you have observed the amount of money that British Petroleum have been spending on a campaign with the subtitle "Beyond petroleum". You have just described an attractive chemical process which ticks a lot of boxes. Do you have any thoughts as to why BP do not appear to be investing in this? If they want to go beyond petroleum, it seems, given the amount of money they have at the moment, to be a natural place for them to be.
Professor Bridgwater: I understand BP are the biggest seller of biodiesel in Germany and the second biggest retailer of ethanol in the USA. It comes down to the perceived state of the market at the moment and the attractiveness of the investment.

Q247 Chairman: So your message is "Get the market and the demand and then eventually the investment will follow".
Dr Woods: I can add a little bit to that. BP have invested in a German plant which does exactly what Professor Bridgwater has been talking about and which produces, at demonstration scale, Fischer-Tropsch biodiesel. The interesting question for the oil companies and the reason I do not believe they will invest in a big way in biofuels unless they are compelled to, is that it does not fit their business model at the moment. They would be interested in the production of synthetic biofuels that fit exactly with the infrastructure, not with hydrogen for example, because it does not fit their business model. However, in order for them to control the supply chain, they have to get involved with agricultural production and biomass production. For example, Shell in the 1980s used to own very large areas of forestry and withdrew from that and they are worried about getting involved with those kinds of areas. That is potentially a reason that they are not investing yet.
Professor Bridgwater: There is a company in Finland that justifies the claim that conventional hydrocarbon transport fuels, gasoline and diesel, are very attractive. They are currently spending €100 million building a plant to turn biodiesel into conventional diesel. It is a company called Neste in Finland. They are spending €100 million to turn biodiesel from vegetable oil into conventional diesel because it is easy to assimilate into the market and it is much cleaner.

Q248 Lynne Jones: What is the difference? It is biodiesel, if it is from biomass sources. What is the difference between biodiesel and conventional diesel?
Professor Bridgwater: This is the language convention. It is quite complicated. The term Biodiesel is normally limited to vegetable oil derived products like rape or sunflower or palm oil. The synthetic diesel I have been referring to by Fischer-Tropsch like in the Sasol process is chemically indistinguishable from that derived from crude oil, except that the sulphur levels and contaminant levels are much lower and it is much cleaner in use. That is not what I call biodiesel and what most people call biodiesel. Biodiesel is normally limited to vegetable oil or waste fat derived materials which are compatible with, but limited in their miscibility to ordinary diesel. I hope that helps a bit.

Q249 Chairman: Perhaps you could just clear up one little point for me. My attention was drawn to the fact that if you take rape seed oil, you can effectively make that a fuel by crushing out the rape seed oil; you have your oil, you can put it in your tractor and away you go. That, as a fuel, because it has no processing done to it, pays a full rate of duty, but if you process it, then you get the reduction in duty which is put forward. Can you just explain to me why you have to have an element of processing? It seems to me that if you go from plant to fuel, they seem to take out rather a lot of cost. Why do you then have to do something to it?
Professor Bridgwater: Because the crude vegetable oil is very viscous, it does not flow well in cold weather, deposits will settle out if you have a frosty night and block the filters. It is processed to become lower viscosity, easier to use and more compatible with conventional fuels and there are now some European standards so it can be traded more easily. It is really processing to remove impurities and to turn it into a fuel which is more compatible with the environmental conditions in which we live.

Q250 Patrick Hall: It has been mentioned a number of times that the environment, in this country at any rate, is not clear enough or welcoming enough for long-term investment to take place in the areas that we are talking about. What more then should Government do beyond the Renewable Transport Fuels Obligation which surely does set down very clear markers as to the direction in which we are going which is a clear signal to industry?
Professor Bridgwater: It is the timescale that is the problem. In the meetings or discussions I have had with different companies, the concern is that the lifetime of the current obligations are not sufficient to justify large investments. That is what I am told.
Dr Woods: I can add to that for the Renewable Transport Fuels Obligation at least. The way the obligation may work with the buy-out fund is that if, for example, with the 5% target the suppliers only achieve a 2.5% target, they have to buy out the remaining 2.5% and that buy-out would be set at 30 pence a litre, so they would pay 30 pence a litre for each of those litres that they have not made from biofuels and that would go into a buy-out fund. As a potential biofuel producer in the UK, you might think that buy-out fund is going to provide a revenue stream for you providing indigenously supplied

biofuels. However, actually, for example, BP think that they could provide all of the 5% by 2010, which is a volumetric basis, by putting raw vegetable oil through a hydrogenation unit at the front end of an oil refinery and so meet the entire fractions using straight vegetable oil and therefore there would be no money accruing to the buy-out fund. Secondly, from a biofuel supplier's perspective, that introduces an aspect of uncertainty into the value of their fuel. The duty derogation is on a three-year rolling reconfirmation. That is due to run out in 2008, so if you were to put in your plant, you would have three years of 20 pence duty derogation. You know from the way the RTFO is currently set out that the duty derogation will go down and the buy-out price will go up, so if you are a potential biofuel supplier, you are guaranteed that 20 pence derogation no matter what at the moment, but only for three years. You are then into a second-guessing game about what is going to happen to meeting the target and the value of the buy-out fund in the following years and yet in the RTFO, even in its current constituency, that buy-out price is due to decrease and that has been clearly set out. Then there are some question marks into the box as to what the value is beyond 2010. That is only a four-year horizon for them to be working with and a huge amount of uncertainty in terms of the value of their product.

Q251 Mr Vara: May I move on to the subject of research? You will of course be aware that recently the Natural Environment Research Council proposed that four of the eight sites for the Centre for Ecology and Hydrology should be closed to save money. By way of background, up to 200 people will be made unemployed at those four sites and some of them are world-class scientists. The issue is that some of them will be relocated to the other sites, others may move on to universities and other academic institutions, some will be enticed to go abroad. The facilities themselves, for example at Monk's Wood, have been going on for 40 years; a lot of the equipment has been built up over the years, a lot of expertise, contacts with the local environmental agencies and so on. One of the environment ministers, Elliot Morley, says and I quote "... the restructuring that the Natural Environment Research Council has proposed for CEH would not reduce the amount of independent research into climate change nor reduce capabilities for the long-term collection and analysis of environmental and ecological data". Do you agree with the Minister?

Professor Bridgwater: I am not so familiar with the work of these NERC institutes, but the funding from the research councils for some of them is partly to support the infrastructure of the establishment's laboratories and it partly goes to supporting either consortia like TSEC-BIOSYS that Jeremy is involved with, which result from proposals for funding from the research councils. If they claim that, that the amount of money that is to be spent is not reduced, it is possible to see how centres of excellence could be maintained which are not necessarily based at the laboratories.

Q252 Mr Vara: Professor Bridgwater, with respect, you are almost behaving like a politician in that you are avoiding answering the question. The issue is not one of funds. As far as funding is concerned, the argument that is put forward is that there will be a saving of £7 million every year and the cost is going to be £43 million. There is an argument to say that that does not make very good mathematical sense, but we shall not go down that route. The question specifically was: will the closure of the sites affect environmental research? You say you do not know much about what these sites do; you do not need to. Take my word for it that they are involved in the business of ecology and hydrology, environmental research, climate change and so on. That is the field that you are familiar with, so that is the subject: the closure of four out of eight sites at a time when the world is waking up to the issue of environment, when everyone says we need to do more research. Do you feel that Britain is not actually helping itself in this area by reducing 50% of its sites, its world-class scientists going abroad and so on?

Dr Woods: I am aware that I am probably walking into a deeply political area with this, but I would say, stepping out of that—

Q253 Mr Vara: May I just say that it is a political area, but you are not here in your capacity as politicians, you are here in your capacity as scientists. Let science answer.

Dr Woods: In the light of that, one of the big spin-offs of climate change will be the impacts on hydrology and some of the hydrological models that have come out of CEH are underpinning hydrological models to a lot of the science work that exists. I should say you would have to look extremely carefully at the unified capacity to understand soil hydrology, which is an extremely complex area. I have a view, much like Jonathan Porritt's view, that the recent history of under-investment in production from the land and in agriculture will be looked at in 10 or 15 or 20 years' time with a kind of absolute amazement, but at the moment climate change is going to affect our ability to produce food from land and now we are looking at bioenergy and running out of options as to other energy resources that we can exploit.

Mr Vara: Dr Woods, I am not putting words in your mouth, but are you saying, in laymen's terms, to use language that the Chairman used earlier on, that in 10 or 15 years' time, we shall regret the decision to close these centres which are important for environmental research?

Lynne Jones: I understand that posts are being lost from the Institute for Grassland and Environmental Research too? Perhaps you could take that on board in your answer.

Q254 Mr Vara: I should repeat that I am not asking you to get involved in politics. You are here in your capacity as scientists; your fields are going to have four out of eight centres closed. It is a very simple question. Forget the money side. Do you feel that

this is a good decision or a bad decision for your specific area? Forget the arguments of the politics; a yes or no will do.

Professor Bridgwater: I can comment on the Rothamsted one; I am aware of that merger. It does create some good opportunities for better synergy between the research going on which is currently 200 to 300 miles apart.

Mr Vara: So you are quite happy for world-class scientists to go to the US?

Chairman: I hate to temper the enthusiasm of a colleague, but, in fairness, our panel are not involved directly in the decision-making process to shut these institutions.

Mr Vara: Chairman, I am guided by you and I take note.

Q255 Chairman: I understand what you are trying to get at. What we need to understand is which are the important areas for science and scientific research, so that when the Minister who is going to take these decisions comes before the Committee, with the benefit of your advice, we shall know what questions to ask him as to how he is justifying a decision. It would be helpful to have your response on that line of inquiry.

Dr Woods: The critical issue is whether it enhances or loses the capacity to understand those areas which are deeply complex areas.

Professor Bridgwater: Absolutely.

Dr Rowe: The professor I work under has quite a lot of contact with the CEH as part of our work and she has actually prepared a statement on this which I am willing to give to you as a note. To give you the summary of that, she is saying that much of the short-term work done by CEH could possibly move to be done at universities. The advantage of CEH is their long-term ability to collect data sets over long periods of time and that we need and we do not want to lose. Also at the moment, they are involved with our research into looking at assessing the hydrological implications with SRC, which will be important in the future with climate change, looking at how this crop is growing. They are involved in a coordination role with the UK Energy Research Centre for a roadmap for future research priorities, which is what you were discussing earlier. We are saying that we are aware that extreme care should be taken and if these closures are to go ahead, we must not lose key personnel who are involved in maintaining either these long-term models and research and also people who are going to be looking at future policy planning. How that can be done is obviously something we need to discuss.

Chairman: Mr Vara, when the Minister comes before us, you have now had your card marked as to the areas of the questions you must ask him, as to how he has come to the conclusions which we are quite rightly questioning. May I thank you very much indeed. You have whetted our appetite in a number of ways and, again, the one thing that is apparent is that this subject is a deal more complex than I had thought when I first embarked upon taking evidence on this inquiry. There is quite a balance to be struck between getting the biorenewables, let us use that term, off the ground and perhaps eventually attaching that industry to some of the interesting new processes or not so new as in the case of the Fischer-Tropsch process, which you described earlier. You have certainly given us a lot of food for thought. If at the end of this, there is anything else that you can think of—and Dr Rowe I am grateful to you for your kindness in agreeing to forward the statement—that you want to communicate to the Committee, as always we are very happy to receive a note from you. The only thing I can guarantee is that whatever you have said cannot, as they say, be undone. Thank you very much for your contribution and thank you for your evidence.

Supplementary memorandum submitted by The Biosciences Federation and the Royal Society of Chemistry (Bio 07a)

RENEWABLE ENERGY: THE POTENTIAL OF MARINE BIOMASS

Introduction

1. We began to research seaweed cultivation to investigate their potential for bioremediation, and in particular, their potential to absorb some of the dissolved nitrogen that results from intensive rearing of Atlantic salmon in sea cages on the west coast of Scotland. This project REDWEED or "Reducing the environmental impact of sea-cage farming through the cultivation of seaweeds" showed that the seaweed do utilise farm origin nitrogen and that a prodigious biomass of seaweed can be produced as a result. One of the species we work with, the brown macroalgae *Laminaria saccharina* increases from millimetres to meters in size in a matter of months. (These macroalgae can take up nitrogen from sea water at rates resulting in an increase in their biomass of 10% day^{-1}).

Culture

2. Seaweeds are collected from wild populations at the time when they are known to be producing spores. Ripe fronds are induced to shed their spores in controlled laboratory conditions. The spores are allowed to settle and germinate on strings (1–2mm diameter). Once the plants are large enough to withstand transport these strings are suspended in the sea from a horizontal top rope or long-line. Alternatively strings may be suspended from a floating raft, anchored to the seafloor. The seaweeds are always situated in the photic zone, the surface layers of the sea, to a depth of less than 10 meters.

3. The methods for seaweed culture are well developed; in terms of weight, more *Laminaria japonica* is grown than any other aquaculture species. In fact world aquatic plant production in 2002 was 11.6 million tonnes (US$6.2 billion), of which 8.8 million tonnes (US$4.4 billion) originated from China, 0.89 million tonnes from the Philippines and 0.56 million tonnes from Japan. Japanese kelp (*Laminaria japonica*—4.7 million tonnes) showed the highest production, followed by Nori (*Porphyra tenera*—1.3 million tonnes) (statistics from "SOFIA", The state of world fisheries and aquaculture, 2004. www.fao.org). The majority of this seaweed is cultured for food, and also for the extraction of alginates, therefore the technology for the large scale culture, harvest and processing of seaweeds is well advanced.

4. I should stress that SAMS seaweed culture is conducted on a research scale, but we do not perceive any major technical challenges to scaling-up. Our industrial partner, the salmon farming company Loch Duart Ltd., has committed to commercial scale trials to test the economic viability of production for human food.

5. Sea-cage aquaculture is only one example of how seaweeds are used to ameliorate nutrient impact; they have also been used with effect to treat human sewage and could be grown in, and therefore used to "clean", other industrial sources of nitrogenous waste.

Potential Biofuel

6. As long ago as 1974, the American Gas Association decided to look for a renewable source of methane (natural gas) from the seas and sponsored a project to produce seaweed on farms in the ocean, harvest it and convert it to methane by a process of biomass fermentation. Their research proved that net energy can result from bioconversion, with good yields of methane (approaching 71% (methane) per pound of kelp, greater than any other known biomass source at the time. Methane production varied with the species of seaweed and with their carbohydrate and protein content. However the project suffered from catastrophic losses of seaweeds farmed on exposed coastlines, highlighting a lack of knowledge of marine farming in the US at the time. The US research was scaled down until "a crisis threatens in natural gas supplies".

7. The UK aquaculture industry (90% by value and volume of which is conducted on the west coast of Scotland can claim considerable expertise in marine farming. The knowledge of seaweed culture gained at SAMS feeds in to this expertise. Also, since that time there have been advances in anaerobic digestion technology.

8. It is my observation, therefore, that the time is right to re-visit this area of research and combine our expertise in seaweed culture with the latest developments in anaerobic digestion.

9. RESEARCH NEED: The immediate research need is to test the indigenous seaweeds we can readily cultivate for their suitability for methane production.

Vision

10. It terms of the future scale of the seaweeds cultures, without assessing the methane yield for each species, it is hard to visual the hectarage of seaweed farms required. It is possible that offshore renewable energy installations such as wind turbines, which require a hard substrate, might also provide very suitable locations for culturing seaweeds, (see research by Buck *et al*, Alfred Wegner Institute, Germany). However our methods and perhaps the species we use would have to be adapted from working in relatively sheltered Scottish sea lochs to working in the more exposed off-shore environment.

11. However, seaweeds can also be grown ashore in tumbling aerated cultures, contained in large vessels and fed nutrients generated as waste from another process (terrestrial agriculture or human sewage). In large scale cultures, a proportion of the seaweed could be harvested at frequent intervals to feed a digestor situated in the vicinity. The remaining seaweed would stay in culture to form the basis of the next crop.

12. QUESTIONS RAISED IN ORAL EVIDENCE

Q220—Are we far away from the commercially viable use of seaweed as a source of bioenergy?

A220—Anaerobic digestion is already used to produce methane from plant biomass. Seaweeds have been trialled in the past and are a good source of biogas. We have the expertise to culture seaweeds. What is required now is a pilot project to bring the two sciences together and trial the seaweeds available for culture in the UK with the latest anaerobic digestion technology. I am ready to initiate a partner search for a company or research unit with the appropriate anaerobic digestion facility.

Q221—What level of funding are we talking about to do this developmental work?

A221—I have not begun to cost the exercise, either in terms of a large scale seaweed farm or for use of/construction of an appropriate digestor. However, I would be happy to start to collate figures for such a project. The first step is, as I have said, to identify appropriate partners. I agree however, with Professor Bridgewater that significant advances could be achieved with a project at the lower end of the funding range he mentioned (£5 million).

Q222—So are we working on guestimates rather than an actually worked-out plan and programme?

A222—Absolutely. However a partner search and provisional costing exercise is something we hope to achieve fairly swiftly. I am currently attempting to identify a source of funds to allow me to work on this topic in the coming months.

Q222—area occupied, planting, ownership.

I have already referred to your question as to the size of area occupied/scale of sea farming. In short, without testing the plants for methane production, we don't know. However, I will throw a few facts into the mix which may help give perspective.

- The UK salmon farming industry produces approximately 150,000 tonnes of salmon annually (although less will be produced in 2006—120,000 tonnes) and this occupies an area of approximately 345 hectares (my own calculation). This is a tiny proportion of our coastal resource.
- For comparison, one, medium sized terrestrial cereal farm is on average 240 hectares (Farm Business census June 2003, DEFRA, 2003).
- A seaweed farm of 1 hectare (40, 100 meter longlines), might yield 100 tonnes of seaweed (conservative estimate).

With regard to ownership the salmon and shellfish farming companies lease an area of seafloor for production from The Crown Estate, for which they pay rent. I would envisage that a seaweed farm would operate in a similar way. As the seaweeds are in suspended culture, and in a fixed place, one avoids any issues over ownership.

13. FURTHER QUESTIONS RAISED IN WRITING

(a) What consideration has been given to the effect on marine mammals of nets of seaweed off the coast?

The seaweeds hang in vertical strings or nets suspended from a buoyed top-line or raft and would not extend to a depth of more than 10 meters. If the seaweeds were cultured in inshore areas, then I imagine the risk would be negligible, as there are no reports of mussel farms (which operate a similar system) causing harm to marine mammals. There is no formal impact assessment, of which I am aware, as to the potential impact of seaweeds cultures on marine mammals. Clearly an impact of assessment of larger and offshore farms would be required, as for all types of marine renewable energy. The fact that it might be possible to link offshore seaweed farms and for example wind turbines, would result in a more effective use of space at sea.

(b) Have key sites for such developments been identified around our coast and what consideration has been given to (a) shipping lanes; (b) strength of currents offshore, in selecting/identifying sites?

It is too early in the process for offshore sites to have been identified, or for inshore sites other than those alongside existing aquaculture in western Scotland. However salmon farm cages rarely occupy the whole of their leased areas and these areas could be suited to seaweed production. The additional nitrogen absorbed by the seaweeds would help balance nutrient ratios in inshore waters.

(c) Is this proposal "blue sky thinking" or has any research been undertaken to look at the practicalities developing, harvesting, transporting and processing the seaweed?

In part, this question has been answered above, however I should point out that while the technology is available in other parts of the world where seaweed is harvested on a massive scale (China), and despite a long history of the collection and processing of seaweeds in the outer Isles and the west coast of Scotland for both alginates and fertilisers, the practicalities of large scale harvest of seaweed for methane production as not been explored in the UK. I am however confident the skill base to develop the relevant expertise exists within the UK aquaculture industry.

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Maeve S Kelly

Scottish Association for Marine Science
Biosciences Federation and the Royal Society of Chemistry

June 2006

Further supplementary memorandum submitted by the Biosciences Federation and the Royal Society of Chemistry (Bio 07b)

PRIMARY AND SECONDARY BIOENERGY PRODUCTS RELATED TO LAND USE—ESTIMATED OUTPUTS IN GJ PER HECTARE

Basic conversion process	*Primary product*			*Secondary products*	
				Electricity	*Transport fuel*
	Product	*GJ/ha*	*Value*	*GJ/ha*	*GJ/ha*
Biological conversion					
Ethanol—cellulose only	Ethanol	55	high	22	55
Ethanol—hemicellulose & cellulose	Ethanol	75	high	30	75
Vegetable oil					
Rape oil	Biodiesel	40	high	16	40
Thermal conversion					
Combustion	Heat	170	low	50	—
Gasification	Fuel gas	150	low	70	110*
Pyrolysis	Fuel oil	140	medium	60	95*
					* using Fischer Tropsch conversion to diesel

AV Bridgwater, May 2006

Recovery and processing of hemicellulose would incur extra costs and energy inputs but would supply more ethanol, although the technology of combined cellulose/hemicellulose hydrolysis and fermentation is not as developed as for cellulose alone.

Biosciences Federation and the Royal Society of Chemistry
June 2006

Memorandum submitted by English Nature (Bio 09)

EXECUTIVE SUMMARY

1. If Government policy is used to promote production and consumption of biomass or biofuels in the UK *without any additional safeguards on where those biofuels come from and how they have been produced,* English Nature believes this would risk an increase in agricultural intensification, particularly if combined with high prices, that would contribute to loss of biodiversity both in England and globally, while delivering only small cuts in GHG emissions. We recommend the following measures to prevent this from happening:

Strategic policy

(a) *Government's top priority in terms of climate change should be to improve energy efficiency and demand management.* This is where the greatest reductions in GHG emissions can be achieved in the short and medium term.

(b) *Government bioenergy policy should prioritise use of existing sources of biomass,* to reduce the need for large areas of land to grow energy crops.

(c) Government should ensure that policies put in place to deliver climate change targets will not reduce our ability to meet other important environmental targets, such as the UK Biodiversity Action Plan, the Water Framework Directive and the Soils Directive.

Policy initiatives

(d) *In designing and implementing the RTFO, the government should link allocation of certificates to the amount of GHG emissions saved by the production of biofuels*. It is already proposed that the RTFO should include mandatory reporting on the life cycle carbon balance (including all GHG emissions from crop production, harvest, transport and processing of biofuels). This data could be used in the allocation of certificates—for example, the government could choose to withhold RTFO certificates from biofuels that deliver less than, say, 50% GHG savings compared to fossil fuels.

(e) *Incentives for producing biofuels should be linked to the sustainability of their production system.* A certification scheme should be established that will provide assurance that the crops used to grow biofuels have been managed according to good environmental standards. We understand that this may be difficult because of WTO rules but the Government should make every effort to resolve this.

(f) *Encourage best land management practice in growing energy crops* to maximise greenhouse gas savings in terms of $kgCO_2$ eq/£ while protecting and enhancing biodiversity, water quality and soils.

(g) *Investigate ways of mitigating the possible adverse effects of converting uncropped land into energy crop production*. These could include additional Entry Level Scheme prescriptions for biofuel or biomass crops grown on set-aside (not allowed under current set-aside rules), and for maintaining fallow land on the farm.

(h) *Increase funding for R&D on new crop varieties and management practices* that can deliver both reductions in GHG emissions and improve environmental sustainability of agricultural management.

(i) *Monitor changes in area* of uncropped set-aside land, and the total area of land used for growing energy crops, to provide information on trends in crop diversity and aid in development of mitigation measures if necessary.

(j) *Promote small-scale, local uses of biomass energy,* which can connect people more closely with their energy sources and so have additional benefits such as reduced pressure for industrialisation of agricultural landscapes and need for long-distance transportation, improved public acceptability and educational opportunities.

2. English Nature is committed to providing support and advice to Government and other stakeholders involved in the bioenergy sector, in order to maximise the contribution of this rapidly developing sector to targets on climate change, biodiversity and agricultural sustainability. Achieving these outcomes is likely to prove a significant challenge so we are pleased that the EFRA Committee is holding this inquiry, which we hope will make an important contribution to continuing policy development in this area.

Introduction

3. A new organisation—*Natural England*—is being created with responsibility to conserve and enhance the value and beauty of England's natural environment and promote access, recreation and public well-being for the benefit of today's and future generations.

4. The creation of the new organisation, *Natural England*, is well under way, with English Nature (EN), the Landscape, Access and Recreation division of the Countryside Agency (LAR), and the Rural Development Service (RDS) working together as partners. This natural partnership is delivering joint outcomes and paving the way for *Natural England*, whilst continuing to deliver their separate and respective statutory duties:

— *English Nature* is the independent Government agency that champions the conservation of wildlife and geology throughout England.

— *The Rural Development Service* is the largest deliverer of the England Rural Development Programme and a range of advisory and regulatory rural services.

— The aim of Countryside Agency's *Landscape, Access and Recreation* division is to help everyone respect, protect and enjoy the countryside.

This consultation response has been produced by English Nature. English Nature is working with the Rural Development Service and the Countryside Agency's Landscape, Access and Recreation division to create *Natural England*, a new agency for people, places and nature.

Background

5. English Nature wishes to see an objective assessment of the likely impacts of all major proposed changes in technology deployment in the countryside so that decisions, particularly about public financial support, can be made from a good evidence base. In our view some deployments of bioenergy technology, particularly where they are small-scale and introduce heterogeneity into otherwise homogeneous intensive agricultural landscapes have the potential to be beneficial. Conversely the large-scale industrial production of bioenergy is likely, in many cases, to have a severe environmental downside.

6. Our current energy demand is now so great that providing even a proportion of it from bioenergy is likely to result in significant impacts on biodiversity, either directly (eg crop production) or indirectly (eg opportunity costs of removing farmland, funding etc from other potential end uses). There is a danger that by over-reliance on 'renewables' such as biofuels to deliver climate change targets, attention may be distracted from the wider issues of energy efficiency and demand management.

7. While Government policy clearly states that the main justification for public support for bioenergy is its potential for climate change mitigation, we recognise that various forms of bioenergy may also have other benefits, such as energy security, rural development, employment in rural areas, biodiversity and reduction of waste going to landfill. However, there are potential dangers in confusing policy objectives—for example, attempting to tackle both climate change and rural development using the same funding stream may result in the inefficient delivery of both objectives.

UK Potential for Producing Bioenergy

8. Most forms of bioenergy are not carbon-neutral because of the energy inputs needed to grow biomass and convert it into useful fuel. For example, producing biodiesel from oilseed rape still results in around 40% of the greenhouse gas (GHG) emissions produced by fossil diesel (Mortimer *et al* 2003). However, some forms of bioenergy can be carbon-neutral or even carbon-negative—for example anaerobic digestion of organic wastes may approach or even exceed 100% GHG saving due to avoided landfill emissions of methane, a GHG 21 times more potent than CO_2 (HM Revenue & Customs/HM Treasury 2005).

9. Various assessments have been made of the potential for UK bioenergy production and its contribution to climate change abatement. Agronomically speaking, domestically-grown arable crops (oilseed rape, wheat and sugar beet) could probably produce up to 5% of our current terrestrial transport fuel requirements without impacting significantly on domestic food production, by using existing food crops that would otherwise be exported and by growing biofuel crops on set-aside land. This could represent a total area of around 1 million ha—one-sixth of the UK arable area. To put this into context, we calculate that oilseed rape grown for biodiesel could mitigate around 1.7 tonnes of GHG emissions (measured as CO_2 equivalents) per hectare per year, wheat for bioethanol 2.8 $tCO_2eq/ha/yr$ and sugar beet for bioethanol 4.0 $tCO_2eq/ha/yr$ (based on figures from Elsayed *et al* 2003). Growing a mixture of these crops over 1 million ha could potentially reduce UK GHG emissions by around 2.5 million tonnes per year. This is equivalent to 0.37% of total UK greenhouse gas emissions for 2004 (672 million tonnes CO_2 eq, Defra 2004). In our view this represents a relatively small GHG benefit for a large area of land.

10. Perennial energy crops (short rotation coppice (SRC) willow and Miscanthus and short rotation forestry (SRF) using either native or exotic species) could save significantly more GHG emissions per hectare than arable biofuels. SRC willow or Miscanthus grown on set-aside and used in small-scale CHP can potentially save around 10 $tCO_2eq/ha/year$ in comparison to leaving the set-aside fallow and using natural gas CHP (Elsayed *et al* 2003). An area of 0.5 million ha of SRC willow might be agronomically feasible and if used for this purpose could abate around 5 million tonnes of CO_2 per year, or 0.75% of total UK emissions.

11. Although growing up to 1.5 million ha of bioenergy crops may be *agronomically* feasible, there may be both direct and indirect environmental impacts. These are addressed later on in the submission.

Alternatives to Increasing Cropping

12. Dedicated biomass crop production is just one route for producing bioenergy. However, there are already significant biomass resources in England that can be used to generate heat, power, gas and liquid fuels, without needing to increase crop production. Turley *et al* (2003) estimated that 100,000 tonnes of biodiesel could be produced by processing waste oils from the food industry—effectively substituting for 90,000 ha of oilseed rape. Forestry thinnings, arboricultural arisings, woodland coppicing and other waste wood products (sawdust, pallets etc), can provide wood chips or pellets for electricity and/or heat production from domestic to industrial scale. Some biomass sources have additional environmental benefits: woodland coppicing is important in improving conservation status of woodlands, while anaerobic digestion of animal manures and other organic wastes can help prevent emissions of methane into the atmosphere and reduce nutrient pollution and landfill volumes. Other organisations are better placed to estimate availability of these resources, but in our view a high priority should be placed on using existing sources of biomass, to reduce the need to dedicate large areas of land to growing biomass.

Relative Cost Effectiveness

13. Mortimer et al (2003) found that installing glass fibre loft insulation in domestic dwellings (506 kg CO_2eq saved per £) was over 100 times more cost-effective than biodiesel production from oilseed rape at a fuel duty derogation rate of 20p/l (4.5 kg CO_2eq saved per £). Heat or electricity from woodchips could save four times more greenhouse gas emissions per £ than biodiesel (18 kg/£). This reinforces English Nature's view that the Government's top priority for climate change policy should be to reduce energy demand, as this is where the greatest reductions in GHG emissions can be achieved in the short and medium term.

Role of Agriculture in Reducing Greenhouse Gas Emissions

14. Agriculture was responsible for 7% of total UK greenhouse gas emissions in 2003 (National Statistics 2005). On the other hand, agricultural land management can also contribute to carbon sequestration in soils and vegetation. The Government's Climate Change Programme Review (not yet published) has included an assessment of how GHG emissions from agriculture can be reduced. Methods include reducing use of artificial fertilisers and use of no-till systems, organic farming, clover or other legumes to fix atmospheric nitrogen, crops with lower nutrient requirements, woodland regeneration, anaerobic digestion of animal manures and use of biomass energy/biofuels on farms.

15. To maximise abatement of GHG emissions these practices should be used on all farms, not just those growing energy crops. However, we should be particularly conscious of the GHG balance of energy crop production, because emissions savings are the main justification for Government support. By encouraging best practice in growing energy crops Government can therefore maximise GHG savings in terms of kgCO_2eq/£.

16. However, some farming practices that cut GHG emissions could result in other kinds of environmental harm. For example, one study suggested that growing genetically modified herbicide tolerant sugar beet could result in reduced GHG emissions because it needed fewer machinery passes (Bennett et al 2004). But evidence from the Farm Scale Evaluations programme shows clearly that growing these crops with the associated herbicide regime would result in a significant loss of biodiversity (Firbank *et al* 2003). Government should be very careful to avoid putting in place policies to deliver climate change targets that are likely to harm our ability to meet other important environmental targets.

Environmental Impacts of Expanding UK and EU Areas of Energy Crops

17. There have been a number of studies assessing likely impacts of expanding areas of energy crops in the UK. Turley *et al* (2003) concluded that arable biofuels (wheat, sugar beet and oilseed rape) are unlikely to expand outside of existing production areas but could be grown more intensively within these areas. Some farmers are already growing rotations of wheat/rape/wheat/rape, although this can prove an agronomic challenge due to increased pest and disease pressure in the rape. Agronomists advise increasing the range of seed treatments and fungicide sprays on oilseed rape in these rotations (Monsanto 2004). This suggests that biofuels could accelerate a trend towards less diverse rotations with a greater reliance on chemical inputs to tackle pests and diseases—a trend that is unlikely to offer benefits for the environment.

18. There is evidence that uncropped set-aside generally supports more biodiversity than land under intensively-grown arable crops (e.g. Buckingham *et al* 1999). Compulsory set-aside in England is currently 8% of the arable area, although this varies from year to year. A switch to growing biofuels on set-aside land could cause the loss of around 400,000 ha of uncropped land to winter wheat and winter oilseed rape, which would result in loss of biodiversity, especially seed-eating farmland birds. This could lead to slippage on targets for the Farmland Birds PSA and UK Biodiversity Action Plan. The newly-launched Environmental Stewardship scheme aims to help deliver these targets but was not designed to cope with the impacts of an increasing area of arable crops or widespread loss of set-aside in England. This means that additional measures may be required to mitigate impacts on biodiversity, water resources and soils.

19. However, perennial crops such as SRC willow and Miscanthus could add structural diversity to some landscapes. A recent study apparently showed higher levels of biodiversity in SRC willow compared to intensive arable and grassland crops (Sage *et al* unpublished). These benefits seem to depend on a number of factors such as maintaining a mixed age structure, leaving areas of bare ground and breaking up plantations into smaller segments, as these are all important in increasing habitat diversity. Willow and Miscanthus are generally grown with a relatively low input regime, with likely benefits for biodiversity, soils and water quality, but this could change if pest problems start to build up and/or there is economic pressure to increase productivity.

20. The Forestry Commission recently funded a study on the potential impacts of short rotation forestry (Forestry Commission, unpublished), which suggested that SRF could be compatible with protection of biodiversity, soils and hydrology provided that care was taken to select the right species and design the plantations to fit in with existing habitats and features. However, it cautioned that the highest-yielding, most profitable species (eg *Eucalyptus* spp) were associated with negative environmental impacts, emphasising the need for public funds to support species choice and management practices that deliver wider public goods.

21. Low-intensity, high-biodiversity land uses need to be protected from replacement with energy crops. Currently this is achieved through the Forestry EIA Regulations and the Uncultivated Land EIA Regulations, and it is vital that this system continues to be effective in the face of rising numbers of applications to ensure protection of biodiversity, soils and water resources.

22. Elsewhere in the EU, it has been suggested that the Central and Eastern European countries have greatest potential for expansion of the biomass sector and these could produce enough excess biomass to export to Western Europe (preliminary report of the VIEWLS project, unpublished). In our view this could cause massive biodiversity loss through the intensification of agriculture in these areas, where small-scale low intensity farming currently dominates. It would be a dangerous strategy for the UK to rely on imports from these countries to make up any biomass shortfall.

Sustainability Issues Related to Global Trade in Biomass and Biofuels

23. The UK is a net importer of food and there is relatively little spare capacity within our agricultural land to produce biofuels or biomass crops without displacing some production abroad. In fact, importing processed biofuels such as bioethanol from Brazil could potentially deliver substantially greater GHG savings than producing ethanol domestically from wheat and sugar beet, because sugar cane requires far lower energy inputs to grow and process.

24. However, climate change is only one consideration. Much potential for expanding production of liquid biofuels is assumed to exist in tropical regions which still contain significant areas of important natural habitat. Experience from past and current trends in expansion of soyabeans, sugar cane and oil palm indicates that there is a real danger that increasing production in these areas will lead directly to further losses of natural habitats like tropical rainforests and savannas. In addition to the potential massive impacts on biodiversity and ecosystem services, clearing rainforests for cultivation leads to immediate and massive losses of carbon dioxide and other GHG into the atmosphere: several decades of continuous energy crop production would be needed to recover the GHG released by cutting down tropical forests.

25. In our view, a crucial instrument to help avoid damage to biodiversity both in the UK and abroad will be a robust carbon and environmental sustainability certification scheme. Some work is currently being carried out by the Low Carbon Vehicle Partnership (LowCVP) to develop an industry certification scheme, aiming to create a standard that all companies producing biofuels could sign up to. There is currently pressure for a certification to be only a voluntary measure, but English Nature has a strong preference for linking certification to receiving certificates through the Renewable Transport Fuel Obligation (RTFO). Government should send a strong message that imports of unsustainably produced biofuels are unacceptable and should not receive public funding.

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Witnesses: **Mr James Marsden**, Head of Policy and **Ms Anna Hope,** Biotechnology Adviser, English Nature, gave evidence.

Q256 Chairman: Can we move onto our evidence session with English Nature? May I welcome once again Mr James Marsden, Head of Policy and Anna Hope, Biotechnology Adviser? You have had the benefit of sitting in on our earlier witness session, so you will know some of the things that we are very interested in. In your evidence to us, you highlighted some of the potential incompatibilities between developing the rural economy and the climate change of bioenergy. You counselled us that ". . . attempting to tackle both climate change and rural development using the same funding stream may result in the inefficient delivery of both objectives".[1] That is an interesting observation on government policy. If you were advising the Government, how would you tell them to avoid that potential downfall?

Mr Marsden: We would advise them to take an integrated approach. In earlier evidence you heard about the disaggregation between, on the one hand, approaches to tackle efficiency and demand management, on the other, a push on bioenergy and renewables. The overarching, integrated approach to energy policy, which is the subject of the current review, would be our starting point and from that flows how you incentivise, through the market and with appropriate safeguards for the environment and other benefits to society, the approach to achieve the policy objective.

Q257 Chairman: You are talking about an incentivisation. One of the odd things about biofuels' production is that the discussion has focused on two things: one, the use of set-aside land and the other, the use of land which currently produces versus UK requirements, a grain surplus. The set-aside land effectively is made attractive for biofuels' production because currently by definition it is not used for anything, but you make some points about there being gains in biodiversity from set-aside. On the other hand set-aside land has money paid to it for being in that state. Is that a perverse incentive? The farmer gets money for set-aside, but he also gets something if he puts a crop on it.

Mr Marsden: We should like to put that in some context for you. The very high big picture context is that climate change is the biggest threat we face to the natural environment, therefore English Nature now and Natural England from October will care a great deal about that. As a result, we would wish to work with others to promote bioenergy and biomass production. We would do that within a hierarchy and we are developing our position on this, so what I am going to tell you is a work in progress. If we start from the position that there are going to be certain areas of the country where there will actually be a positive benefit from developing of these resources, to give you an easy example, there are acres of unmanaged coppice woodland in the Weald of Sussex and Kent where, taking account of transport cost, if end user points were brought closer to the market and the production of the coppice wood could be got there at low cost et cetera, there could be a positive benefit, both in terms of the bioenergy produced and to the natural environment. There are some other areas of the country where it would be neutral. There are others where it would be marginal, but the long-term gains in terms of the climate change effect would still lead you to go down the bioenergy route and there would be others where it would be very much on the negative side. So you would need to work down that hierarchy and incentivise accordingly and obviously you could start to put some numbers on that in terms of the hectarages of land involved in a spatial sense.

Q258 Chairman: Do you want to add anything to that Miss Hope?

Ms Hope: I could comment more specifically on set-aside. I suppose our view of set-aside is that although it is not there to deliver environmental benefit, incidentally it does deliver the benefit. While we do not say that we must keep set-aside as such into the future and we accept that it may be phased out at some point, there does need to be a recognition that by promoting production of bioenergy and biofuels and non-food crops and so on, it is going eventually to result in quite a significant change in land use patterns. We really need to plan for that and make sure that any kind of incentives which promote those, do not incidentally create other kinds of environmental impacts, such as loss of biodiversity, whether that is on set-aside or elsewhere in the countryside, such as increases in pesticides and nutrient consumption, because you are growing more crops, you are growing them more intensively and so on.

Q259 Chairman: Do you think that the Government's climate change review, which was produced after you had sent your evidence to us, has changed your perceptions on any of these matters?

[1] Ev 112, para 7

Mr Marsden: I have not actually read the climate change review, so I am not in a position to answer that. I have read Sir Ben Gill's report on bioenergy, but I have not had the time to read the climate change review.

Q260 Chairman: Obviously it is interesting in terms of balance because the report still puts strong emphasis on biofuels; I just wondered whether you had formed a view as to whether in fact it got the balance between that and say the energy saving right.
Mr Marsden: In terms of the balance, we have said quite clearly we are for biofuels and biomass production within some parameters and we have given you a hierarchy and we no doubt may go into the detail of some of that. In essence it is about scale, it is about location and it is about how the resources from which biofuel and biomass are derived are managed. That is how it will impact on the natural environment and that is what we care about. Within the energy balance, there is a great deal more work to be done in terms of addressing demand and efficiency, because, particularly on efficiency, it is neutral as far as the natural environment is concerned, so it is going to deliver real benefits in terms of the impact on CO_2 reduction and it is going to have a negligible potential impact on the natural environment.

Q261 Mrs Moon: I am intrigued by what is being suggested here. Are you in fact saying that what you are looking at is mapping which areas of the country would be best appropriately used for different crops in terms of the impact on biodiversity and looking at where we can focus which crops should be grown and utilised so that not only would they have less impact in terms of biodiversity loss but also have less impact in terms of global warming, by looking at distances to end user?
Mr Marsden: That last point is outside our remit but we care about it. We can use geographic information systems to present what needs to be done for the natural environment in a spatial context. We can say what the current resource is, where it is, what some of the pressures are and we can also map some of the targets of where we should like it to be. In future Natural England will set out to provide that data spatially to everyone that we work with in a clear framework. That is what, as Natural England, our first corporate plan will set out to do. If you then place that into the broad knowledge of the land that is currently "semi natural", the land that is currently in arable cultivation, the land that is in permanent grass et cetera, you can begin to paint the picture that you have described, yes, and you could begin to say it would be better done there rather than there.

Q262 Mrs Moon: So you are going to add to the complexity of the matrix in one sense and also simplify it in another. You are adding another dimension which, to be honest, I have long felt was missing and it is going to be interesting to see your output. When do you think you are going to have this completed?
Mr Marsden: It will take some time. We have set out to put this in place over the next period of years, but that is not multiples of years, it is 18 months to two years. I do not have the exact date because I do not have the corporate plan immediately to hand, but there is a target date attached to it and we can provide that to you. There is a further bit of complexity and I am pleased that you raised that. There are no hard lines around some of that hierarchy. I used the coppice or the woodland management example, where we could be talking about an ancient wood that is a protected area here that needs managing and coppice management is the right prescription. So we are not saying that protected areas are no-go areas; that is the message I want to give you. It is complex and it is ultimately about the sustainability bottom line and from our perspective, the environmental sustainability bottom line.

Q263 Mrs Moon: It does seem that the further we get into this whole inquiry, the more complex it becomes in terms of getting that delicate balance right between the cost implications of understanding which route you need to go down to offset the carbon emissions but also what the implications are in terms of the cost of reducing that carbon emission over here and what you are setting up in terms of the consequences of the route you are going to follow over here. I just wonder, in a very simple solution, if you had 100 acres of arable land and 8% of it was set-aside, what you would do?
Mr Marsden: I shall give you a simple answer and then I shall pass on to Anna who may add some complexity. If it is arable ground and it has been in arable for years—I am taking your example—it is likely to have pretty limited biodiversity interest. So anything is going to be better than the rotation of oil seed rape and wheat followed by potatoes, possibly followed by a silage crop of grass. It has to be better. It depends how you manage the biomass or bioenergy crop that you put in place and, in terms of a set-aside, if that were to go into Miscanthus and short-rotation coppice, which have already been used in evidence this afternoon, again how is that to be managed? What is the scale effect, what is the location effect?

Q264 Chairman: One of the things which comes out of what you are talking about is how we value certain things. There was, in some earlier evidence, a discussion about the social costs of greenhouse gas emissions in trying to work out what the costs would be to society of over-emissions. In the same sense you are talking about protecting biodiversity, but we do not know how we value that, we cannot put a monetary sum on it. Just following on this business about land use, you heard the earlier discussion where we were looking at alternative ways in the liquid fuels market of producing biofuels which would not involve a rape seed monoculture. One of the questions I would ask you is whether you envisage giving guidance to Government as to what they should be doing by way of incentivising the production of biofuels in whatever way the end game

is, taking into account potentially some of the downsides of having a monoculture of one crop as opposed to the more sophisticated processes which would have a diversity of sources of raw material which may have an upside in biodiversity. However, at the moment we cannot impute a monetary value to that, we could not give an investor something to say that the Government are giving them something because we think it is good to do this because it is good for biodiversity.

Mr Marsden: On the first point, we do intend to provide a clear framework for assessment. I cannot put a timescale on it, but we do intend to provide that framework for assessment of energy crops on both biodiversity and on landscape. That will be part of Natural England's role and we shall provide that and you will find those words that I have used in our corporate plan when it is published. In addition we shall wish to encourage biomass energy positively and production from wood fuel products, energy crops and indeed from agricultural waste. We shall set out and go out to work with people to help the Government achieve those targets; that is our baseline, we shall provide the framework. The valuation one is trickier and I am not able to give you a clear answer on that one.

Ms Hope: May I add another perspective to that? Ideally what we should like to do is to deliver a range of different benefits. We should like to save carbon emissions, we should like to increase biodiversity, we should like to cut nutrient pollution, we should like to deliver beautiful, attractive landscapes which are historic and so on. What you have to come back to, in my view, is that land management is critical to enhancing biodiversity. Land management is critical to that, whereas there is a whole range of ways that you could save greenhouse gas emissions, so why focus on delivering the greenhouse gas emissions while following a policy that is actually risking harm to biodiversity because there are not many ways you could actually mitigate that harm? Let us try to internalise the value of those public benefits that can be delivered if appropriate management practices are followed, if you plan it, if you make sure the crop is in the right place and so on. Then you will automatically deliver all those benefits that Government are trying to deliver anyway.

Mr Marsden: It picks up on Mrs Moon's point. You can actually do that if you incentivise and get the right things in the right place.

Q265 Mrs Moon: Many years ago I read a book called the *Tanstaafl Principle*. I do not know whether you know about it. It actually talks about the issue we are looking at here which is weighing up priorities and costing our priorities and putting costs against losing natural habitats and losing biodiversity and the fact that we do not ever cost that and put that into the financial equation. What you seem to be suggesting is that we are looking at actually doing that and finding a way of moving forward on that. What worries me is, given that we do not seem to have an end date for the policy and the production of your report, that we could actually get out of sync as Government are moving to drive forward on these issues. What I should hate to see is that your report comes out, but the Government have already made decisions and you are two years down the line, but Government are going to have to make decisions in a shorter timeframe.

Mr Marsden: You have given us a firm push; thank you.

Q266 Mrs Moon: Good. I do think the Government are having to weigh up those concerns now and clearly those concerns have to be addressed in terms of carbon emissions, but also loss of biodiversity. So please do move forward on that. We have also today had another issue raised; sadly we were not able to look at it with Dr Kelly because she has not been available. The issue of tackling bioenergy from seaweed is something that was put down to us as being very attractive with a huge potential for tackling CO_2 emissions, but what we have not been able to look at is what the implications are for marine biodiversity and marine habitat. Is that something that Natural England and your report are going to look at? Is that something you are also putting on hold?

Mr Marsden: Let me start by saying that when we had notice of your questions, we had to do some fairly rapid research into this area ourselves because English Nature has not done much work in this area. The work that has been done has been done in Scotland by our colleagues in Scottish Natural Heritage, so I can refer a little bit to that. Before I do so, our position would be, going back to the framework hierarchy that we gave you earlier, better do it on East Anglian arable farmland, than do it at sea. That would be the starting point in terms of the approach to biodiversity risk. What we know about how to create and plant and manage bioenergy crops on arable land is a great deal more than we know about the harvesting at sea and therefore a risk-based approach suggests that if you can do it on arable land and meet the targets, you do it there first and you work through the rest of the hierarchy we gave you before you look to the sea, but you also need to do the research. Within that set of constraints, there are some things that, in the Scottish research, we can say need to be looked at. I have used the example of woodland coppicing before and there are one or two similarities in terms of how you might harvest seaweed. In particular, you want to look at the harvesting methods, the rate of regeneration, the cutting height, and whether or not the mechanical harvesting removes the hold-fast of the seaweed on the substrate which it is on, because, if it does, that affects the regeneration rate. Of course, we would want to understand the effects on the biota that both feed and use the seaweed as their habitat. There are also some issues about return time. It is a complex area and we do not yet know the answers, but a bit of work has been done in Scotland.

Q267 Mrs Moon: You say that "a bit of work" has been done. In terms of costs, figures that we have had have been in the billions and several millions to do this research in relation to bioenergy from the sea

and from seaweed. Would you comment on whether or not, if you are putting, let us say £50 million into research, in terms of energy crops, you would put your £50 million into looking at energy crops from the sea or would you put your £50 million into energy crops from the land?
Mr Marsden: The straight answer is the one I gave you earlier: I would do it on land.

Q268 Lynne Jones: You, like many other people, have called for a carbon energy environmental sustainability certification scheme. You have made reference to voluntary schemes being developed, but you are clear there should be a link between the certification scheme and the Renewable Transport Fuel Obligations certification scheme. Could you perhaps tell us a bit more about how you envisage that would work and who would be responsible for administering it?
Ms Hope: I should first of all say on the overall concept behind the accreditation and sustainability on the carbon, if you look back to the RTFO, that we were happy for the RTFO to be introduced. How we see it is that it offers the opportunity, in a sense, to control the biofuel sector in that any kind of incentive that is going towards biofuel production can potentially be linked to some kind of quality standards that will provide environmental assurance. So for us the bottom line really is that any system of production for biofuel, that is whether it comes from agriculture or whether it comes from re-use of existing raw materials, by-products et cetera, has to meet certain baseline sustainability criteria. Once that has been met, we should then like to have a carbon accreditation scheme that would be able to incentivise improvements in carbon savings. That is the overall context. If we were to talk specifically about how the mechanism would operate, we are very keen for it to be linked to the RTFO because otherwise essentially you have a scheme which will probably incentivise the cheapest biofuel production. At the moment the Government's proposal for the RTFO is that there should be mandatory reporting on carbon savings and mandatory reporting on environmental sustainability. What that essentially means is that companies are free to source their biofuel from wherever they like and although they have to admit it, maybe that will not make much difference. We are very keen for them to take a further step and say, for example, the more carbon you save, the more certificates you will get under the scheme and that provides a financial incentive because of the buy-out price and so on. In terms of how it would work in practice, we have been working mainly through the forum of the Low Carbon Vehicle Partnership, with which you may be familiar, and that body has been commissioning some research into developing a system for how the carbon accreditation would work, the kind of measurements you would need to take, how the calculations would be performed. Secondly, they are doing some research into what a sustainability standard might look like. Ultimately the intention is that that would be passed onto an official body like the British Standards Institute, which would be able to develop it further into a standard which industry can sign up to.

Q269 Lynne Jones: Would this be a UK standard?
Ms Hope: In the first instance. If you look at the European Union, the UK has really been a pioneer in this whole area. What has been interesting is that since the Commission and other Member States have started to hear about the work we have been doing in the UK, they have all become very interested in it; and the Low Carbon Vehicle Partnership has given presentations around Europe and there has been a lot of interest. Now we have seen, through the European Commission's Communication on Biofuels, that there are now moves within Europe to establish some kind of central accreditation scheme.

Q270 Lynne Jones: How has the LowCVP been funded? How has their work been funded? Is that an industry scheme?
Ms Hope: I believe that the actual piece of research has been funded by a number of different bodies which are members of the LowCVP which have put in money towards it.

Q271 Lynne Jones: So commercial organisations.
Ms Hope: Plus some NGOs. It has buy-in from a whole range of stakeholders.

Q272 Lynne Jones: You obviously support an international scheme, but you have expressed concern about the feasibility of such a scheme under WTO rules. Can you perhaps explain your concerns and do you have any ideas about how those problems could be overcome?
Mr Marsden: The concerns are fairly self-evident and I am sure others will have raised the issues of natural resource depletion offshore, because it will be very difficult to meet the existing targets in the UK or England alone and we shall need to import. If we import from countries which have standards which are less than our own in terms of environmental sustainability, there are all sorts of examples: you can point to soya bean in the Amazon and to palm oil in the Far East. Yes, there is a clear difficulty in relation to that with WTO. The proposition we would put to you would be that there should be some kind of equation between what we import and the incentives, advice and support that UK Government, or UK plc, offers to the developing countries or to the countries from which we import that bioenergy to do it in ways which are environmentally and socially sustainable.

Q273 Lynne Jones: You do not see any potential for the WTO agreeing that carbon emissions and sustainability are issues which should be able to be taken into account in deciding in terms of trade?
Mr Marsden: My limited experience of WTO matters suggests that it would take a very long time and we do not have that time and the answer still would possibly be no.

Q274 Lynne Jones: So it is a question of intelligent customers really.
Mr Marsden: Yes, intelligent customers.
Ms Hope: I believe that the opinion of the Department for Transport's legal team was that because of the wording in the Energy Act linking biofuels specifically to cuts in carbon emissions there is a potential for there to be a mandatory scheme which would take into account carbon savings because that is what we are trying to do. Environmental sustainability would be more difficult, but we believe that could still be further investigated. However, certification, which we want to see, can only deal with part of the problem and the other part of the problem is really the kind of wider land-use issues of general global demand for these crops increasing. That is going to mean an intensification of existing farming systems and potentially massive loss of natural habitat and some of those natural habitats being incredibly important for providing habitats for biodiversity, ecosystem services and so on and buffering against climate change. What Mr Marsden was referring to also was, for example, if we were to see further increases in the target from 5% upwards we would be very concerned if that were not accompanied by some kind of assessment, some kind of impact assessment which would look at where those fuels were likely to come from. We shall not be able to produce more on our own land and if we can identify where the additional fuels are likely to be imported from then are there ways in which we can help to mitigate any adverse impact or support those countries in developing their systems to be more sustainable across the board.

Q275 Lynne Jones: To what extent do you think membership of a voluntary body such as the Round Table on Sustainable Palm Oil can influence the environmental production methods of non-food crop production overseas?
Mr Marsden: Yes, but the other routes are through the education of the consumer to the risk we have been talking about and also the investors. Investors and fund managers are taking an interest, particularly in palm oil but also in soya. That is another route to achieve this.

Q276 Lynne Jones: So you approve of the efforts of such organisations. You think they are well worth it or are they just fronts?
Mr Marsden: Yes. In the hierarchy of importance in the framework we painted for you earlier you would have to put rain forests in the Amazon or the Far Eastern countries ahead of anything we have here.

Q277 Lynne Jones: Is there a role for Government in terms of mandatory information schemes, for example, such as energy rating schemes on appliances? Should there be some kind of requirement to declare the environmental impact on carbon emissions?
Ms Hope: That is already proposed under the RTFO. They have proposed mandatory reporting; that is essentially what it is. I am not familiar with how it works but presumably every year a report might come out where each country had to say where it had sourced its biofuels from, whether those suppliers were certified in any way, what level of carbon savings they had achieved on average and so on. What we are saying is great, that is a good start, but we want to see it taken further and incentives given otherwise what is the incentive for moving towards the kind of second-generation technologies the previous witnesses were talking about? Where is the incentive in that? It will probably cost more money, at least to start off with.

Q278 Lynne Jones: I was thinking more of information to consumers, so if they are filling up at a petrol station they should be told that kind of information.
Ms Hope: Certainly the consumer needs to be made aware of these issues.

Q279 Lynne Jones: Has that already been proposed?
Ms Hope: I am unsure whether it has been proposed quite yet. We are not quite at the stage to be able to offer that anyway because the information is not there.
Mr Marsden: We would wish to say that if it can be done for fish, why not for biofuel.

Q280 David Lepper: I was interested in how effective you thought the Round Table was and we have explored that. May I go back to the issue Madeleine Moon raised and what she described as the mapping exercise that you are involved in? Did the impetus for that come from English Nature as part of your ongoing work or was it something government asked you to do?
Ms Hope: English Nature, in collaboration with a number of other agencies, including the Forestry Commission, the Environment Agency, the Countryside Agency and English Heritage, asked for a meeting with Defra, probably about a year or 18 months ago. We said we had some concerns about some applications there have been for some fairly large biomass generation plants and we do not necessarily think they are in the right place or maybe the scale of them is inappropriate to where they are proposed to be. What we should like to do is to propose a system, initially just for mapping our energy crops in terms of where the most and least suitable areas might be. That would help in a number of ways. It would help the developers of those plants to have an indication of where they might have a better potential for getting planning permission through because availability of feed stocks, transport links and so on are very important. It would also help us, and the other agencies involved, in doing the environmental impact assessment for the individual crops, which we have yet to see in terms of the cumulative impact which is quite difficult to assess. You could look at one crop of willow and say it is okay to go there because there are no particular environmental impacts, it is not close to a designated site. However, what happens when you start getting in 100 or 1,000 applications

for crops in that area and you might not be expecting it? It is this whole anticipation, helping us to plan ahead.
Mr Marsden: That bit of work is the new bit. The existing bit is the mapping of countryside character and of natural features and biodiversity across England, and not only the protected areas but also the UK biodiversity targets which need to be met and where they need to be met. That is the ongoing bit.

Q281 David Lepper: You and others went to Defra initially?
Mr Marsden: Yes.

Q282 David Lepper: Defra signed up to what you are doing. Are there other government departments as well or is that not a question you have asked?
Mr Marsden: I am not equipped to answer that. We talk to DTI regularly on energy and particularly about other renewables.
Ms Hope: They may have been involved with discussions with Defra but Defra is essentially leading on that. We have also sought to involve the Regional Development Agencies and Government Offices in that work. It is the kind of work which is more appropriately done at a regional level.

Q283 Mr Vara: If you had a wish list of three things you would like in terms of being able to do your research and work better what would you advise us to try to obtain from Defra when we have ministers before us to allow you to do your work better and more efficiently?
Mr Marsden: That is in the round. In the round we should like Natural England to be resourced and equipped to succeed in the mission it has been given, the purposes it has been given and to be resourced to achieve the outcomes it will set out in its first corporate plan.

Q284 Lynne Jones: Are you not?
Mr Marsden: That is still a matter of debate between our chief executive designate and the department.

Q285 Mr Vara: By resource do you mean money, equipment, centres and research personnel.
Mr Marsden: Yes. The next on my list would be a favourable outcome to the ongoing discussions about modulation and co-financing in relation to the England rural development plan because if we are not adequately resourced to roll out Environmental Stewardship, both the entry-level scheme and the higher-level scheme, we are going to be in a very difficult place. That big item flowing out of the deal which was done just before Christmas in Europe, through into the England rural development plan and the negotiation Defra will need to have with Treasury in the context of the spending review, is very high up on our list.

Q286 Mr Vara: There are two there. Do you have a third one? You do not have to have one.
Mr Marsden: I am happy with that.

Q287 Mr Vara: Do you feel that closure of the four CEH sites is going to impact on biodiversity research and climate change given the urgent nature of research in that area?
Mr Marsden: We are very, very disappointed by the decision. We think it is a very significant loss. Despite the assurances which have been given that key research on biodiversity and long-term monitoring will be retained in strength we find it difficult to understand how that can be achieved with the closure particularly of two centres, the Winfrith site and the Monk's Wood site, with whom we have very, very long-standing relationships and long-term research. The point was well made by the earlier evidence. We are worried about possible impacts on some very important research projects. We do not yet have the answers but there is a long list of things which we could talk to you about which are very much on our worry list as far as that decision is concerned.
Mr Vara: I am grateful for that answer. I have to confess that I am particularly grateful for the candidness with which you got off the fence.

Q288 Chairman: Who did the work which came to the conclusion that there should be a reduction in the number of sites?
Mr Marsden: I do not know the answer to that.

Q289 Chairman: Was it done by Defra itself?
Mr Marsden: My belief is that it was done by NERC.

Q290 Chairman: At the request of Defra?
Mr Marsden: A proposition was put to the NERC board. English Nature made a submission into the consultation, the gist of which I have given in my answer.

Q291 Lynne Jones: They did respond to that consultation by reducing the loss of posts.
Mr Marsden: Indeed.

Q292 Lynne Jones: Do you think that response was inadequate?
Mr Marsden: It still involves the closure of three of the sites and the risks I have highlighted will be evident.

Q293 Lynne Jones: Could you let us know the specific concerns you have? Could you comment not just on CEH but IGER and Silsoe as well?
Mr Marsden: What I should be very happy to do is to share with you the response we gave to the NERC consultation.[2] It is something we should be very happy to send to your Clerk in full. We shall take that away.
Chairman: That would be very helpful indeed. Obviously the issue has been raised as to whether we have the necessary knowledge base to tackle some of the fundamental scientific issues which CEH have been involved in in this area and it is quite clear that

[2] Not printed.

knowledge and understanding is the key to making good decisions in this area. It is something the Committee will want to come back to.

Q294 Lynne Jones: There are institutions funded by BBSRC[3] as well if you wanted to comment on that. Also the actual internal research capabilities of departments, not just Defra but perhaps other departments, if you have any comments. When we had the Environment Agency before us they were saying that they had difficulty in actually recruiting environmental scientists. I do not know whether that is a problem for you and these closures, these changes would impact on the potential for young people going into these areas of scientific research.

[3] Biotechnology and Biological Sciences Research Council

Mr Marsden: My view would be that it will undoubtedly impact. To answer the first part of your question, historically the Nature Conservancy Council and English Nature have had little difficulty; it has been seen as a job people want to do. Indeed the people inside those organisations have a passion and a personal belief in the purposes of the organisation and that tends to be why they joined. They are very good scientists first, but if you look at the number of staff with scientific degrees currently employed inside English Nature there are a great many and many of them have second degrees as well.
Chairman: Thank you very much indeed. You have given us some very interesting perspectives, particularly in terms of the relationship between the practical world and the world of research which the Committee will want to follow up. Thank you very much both for your written evidence and for your oral evidence this afternoon and thank you for agreeing to share your own submission about CEH with us.

Wednesday 3 May 2006

Members present:

Mr Michael Jack, in the Chair

Mr David Drew
James Duddridge
Patrick Hall
Lynne Jones
David Lepper
Mrs Madeleine Moon
Mr Dan Rogerson
Sir Peter Soulsby
David Taylor
Mr Shailesh Vara
Mr Roger Williams

Memorandum submitted by Shell (Bio 30)

1. I welcome the opportunity to make a submission to the Committee's inquiry into the role of bio energy. Shell is a member of the UK Petroleum Industry Association (UKPIA) that has submitted evidence to the Committee, which we support. I have set out below some additional information that I hope you will find helpful.

2. Shell is amongst the world's largest blenders of transport bio fuels and a world leader in bio fuel distribution. We sell around 2.5 billion litres of bio fuels a year, mainly in the USA and Brazil, and spend $1 billion per annum on bio fuel components for our fuels.

Advanced bio fuels

3. Bio fuels are realistic contenders as major low carbon fuel sources for the future. Ethanol from food crops and bio-diesel from plant oils serve as an entry point but have limited potential for further cost reduction. They may also be limited by land-use considerations. New fuels based on a wide range of non-food biomass, including residues and energy crops, could overcome these limitations while further reducing CO_2 emissions.

4. Shell is involved in the development of cheaper, more efficient, and potentially cleaner advanced bio fuels. Shell has formed a strategic partnership with Iogen, a Canadian company that is a leader in new technologies that convert the cellulose contained in plant residues, such as straw and stems, into sugars. In April 2004, Iogen announced the production of the world's first cellulose ethanol fuel available for commercial use, at its demonstration plant in Ottawa.

5. Shell is also investing in CHOREN Industries in Germany which is developing Biomass-to-Liquid (BTL) processes. This takes a woody feedstock (eg willow), gassifies it and then converts the gas into high quality diesel fuel. The product is supported by carmakers such as Volkswagen and DaimlerChrysler because it can be used in an unmodified diesel engine without compromising performance, and with a substantial reduction in harmful emissions.

Bio fuels in the UK

6. In light of the Renewable Transport Fuel Obligation (RTFO), Shell is already working on plans to introduce bio fuels into its fuel products manufactured at its Stanlow refinery in Cheshire. Shell UK is working towards meeting the 2010 target of 5% bio fuels. While supportive of the implementation of a RTFO regime, we note that the 2010 target sets a very challenging timeline for the industry, as it will require significant investment in refineries, distribution and in acquisition of bio fuels. Shell supports the work being undertaken by UKPIA to change the current limits on bio fuels in the EU road fuels standards. We consider that this would improve the take up of bio fuels at minimum cost, and improve our ability to increase bio-fuels volume available in the market in-line with the RTFO requirements.

7. Shell believes it is important that the RTFO should be applied in a way that helps the future introduction of advanced bio fuels that have the potential for larger greenhouse gas savings, lower costs for the consumer and opens up a range of new sources of biomass, including waste. This will ensure that bio fuels with a higher potential to reduce carbon emissions will be introduced into the market. Shell supports the work being undertaken by the Low Carbon Vehicle Partnership to develop environmental reporting for the RTFO.

Conclusion

8. Shell is actively developing bio fuels and working to introduce them into the UK market as part of its obligations under the RTFO. However, it should be noted that petrol and diesel from hydrocarbons would provide the vast majority of transport fuels going forward due to their low cost, availability, and ease of use. Shell is developing fuel-efficient cleaner gasoline and diesels as well as developing alternative transport fuels. In addition to bio fuels, we are also investigating the potential of new fuels such as hydrogen, gas-to-liquids (GTL) and compressed natural gas (CNG).

Head of UK External Affairs
Shell
April 2006

Witnesses: **Mr Darran Messem**, Vice-President of Fuel Development, and **Ms Tanya Morrison**, UK External Affairs Manager, Shell International UK, gave evidence.

Q295 Chairman: It is four o'clock so we will start our evidence session on biofuels and welcome the representatives for our first session from Shell. For the record, we welcome Darran Messem, the Vice-President of Fuel Development for Shell International Petroleum. Are you the man who makes Michael Schumacher go faster?
Mr Messem: My colleagues do that.

Q296 Chairman: And Tanya Morrison, the United Kingdom External Affairs Manager for Shell International. In your helpful evidence, you told us that Shell is amongst the world's largest blenders of transport biofuels and a world leader in biofuel distribution and that you sell around two and a half billion litres of biofuel a year, mainly in the United States and Brazil. To put that into context, what does that represent of the total road fuels market that you service?
Mr Messem: That is just under 1% of our total road and transportation volume.

Q297 Chairman: So 99% is still conventional?
Mr Messem: That is right.

Q298 Chairman: Would you count Shell as a company that was really enthusiastic, with only 1% of sales in the "new" column for this new technology, or perhaps not so new technology because, going back to motor sport, I seem to recall that cars at the Brickyard, Indianapolis, used to run on bioethanol many years ago, now replaced by more conventional fuels, so it is not that new, but are you really enthusiastic about these fuels today?
Mr Messem: I can speak from my personal experience that Shell is very enthusiastic about alternative fuels. I report to a biofuel supervisory board that consists of four of our most senior international executives and I get an immense amount of encouragement and support for what we do in this area. You are right to say that the technology is not all entirely new. The ethanol fuel, that the US market is very enthusiastic about at present, has been around, obviously, for many years and, of course, the original diesel vehicles were developed with vegetable oil, including peanut oil, right from the very early days; so some of the technology is not new. The biofuels that are better for the societal objectives that we are seeking to meet are very much based on new technology. These are what we call second generation biofuels that offer lower carbon footprints and do not tend to rely on the food chain for their feedstock and resource, and to develop those technologies there is an awful lot of brand new technology and technology under development.

Q299 Chairman: Given the 99:1 ratio, we are currently discussing issues both of climate change, fuel security and the diminishing source of conventional hydrocarbon-based fuels. What is the Shell roll-out programme? You have got your Board, you report to them, you are enthusiastic, you are committed, but do you have a little graph on the wall that has the "time" and "percentage" for biofuels, or second generation biofuels or other types of fuel? Do you have a future trend line that you can share with us?
Mr Messem: We have a demand projection, which we use for making assumptions around the amount of biofuel supply that we are going to require, and we look at that on a market by a market basis. I think, looking at the 1%, it is important to recognise that that 1% is 1% of quite a big operation. In 2005 our total biofuel volume was very nearly three billion litres. It is growing at about 15% compound at the moment, so it is quite a substantial growth curve that we are climbing up and it is quite a substantial volume that we have to distribute and blend. When you mention the projection going forward, Shell is not a biofuel manufacturer. Shell is primarily a hydrocarbon energy company with interest in renewable energy, and much of the renewable energy work that we are undertaking is at the more technologically advanced end of the energy business, because we are seeking lower carbon footprints and we are seeking economical pathways to production. Currently all of the biofuel that Shell distributes and sells is made by third-parties and Shell buys that fuel in according to where that fuel is required in the Shell distribution system. We do not project a Shell manufactured volume, we project our estimated requirement for biofuel, and our estimated requirement is, of course, partly a function of the financial incentives that are in place for it, partly dependent upon the mandates that are put in place and that we are required to meet and partly due to where we see for ourselves a business strategy benefit or an economic benefit from becoming involved in the biofuel supply chain.

Q300 Chairman: That suggests that you are doing it because (in the case of the United Kingdom) we have got a Road Transport Fuels Obligation, but you are not doing it because you think it is a good strategic move to say that Shell, as you say, is a major player in the conventional fuels market and will now invest in manufacturing capacity to move it into biofuels or other fuels. How are we to understand that? Are there other routes that Shell is going down that you think will bypass the biofuels route, because we as a Committee are aware that in the transport sector emissions continue to rise and there are only so many known solutions to that particular problem?

Mr Messem: As I said, there are really three conditions that we are responding to with biofuels. In some markets there are mandates. For example, in Brazil, which is our second largest biofuel market, we have been required to distribute and blend biofuel for the last 25 years. In some US states there are mandates and there we have implemented ethanol where we have been required to do so. In mandated markets the challenge for us is that biofuels are typically more expensive than conventional fuels, typically have a lower energy content and typically are not demanded by consumers, and so there is always a degree of resistance to overcome in the implementation of biofuel, often from our customers rather than specifically from Shell, and so, in response to mandates, we implement biofuel where we are required to do so for legal reasons. Secondly, in response to financial incentives, where we are placed at a commercial or a competitive disadvantage by competitors taking up financial incentives, in some areas we will be required to respond in order to maintain our competitiveness. Thirdly, there are areas where we proactively choose to introduce biofuel where we see an opportunity to serve our customers better and where we see an opportunity to differentiate ourselves in the minds of the consumer. Those instances are relatively few presently, simply because the consumer demand for biofuel is limited and the economic penalty is substantial because of the cost base.

Q301 Chairman: There used to be a man who walked round with a placard saying, "The end of the world is nigh." For some the final run-down of hydrocarbon fuels represents the end of the world. What is the Shell working timetable for the run-down of hydrocarbons? The sense I get is that you are doing it because in some markets you have got to do it and in some places you think it is not a bad idea, but I do not sense a great enthusiasm for biofuels. If we are seeing a run-down of conventional hydrocarbon fuels over whatever timetable it is, what are you doing that you are enthusiastic about to replace them?

Mr Messem: We have two principal technology ventures that I am extremely enthusiastic about, and so are my colleagues. I am on the Board of Iogen Corporation in Canada, which is the world's leading producer of cellulose ethanol. The second venture, that my colleague Ken Fisher is on the Board of, is CHOREN Industries GmbH in Germany, which is a producer of BTL liquid, which is a zero-sulphur diesel fuel that is made principally from timber but can actually be made pretty much from any form of biomass. These two technologies are substantially superior to most conventional biofuel technologies. Their well-to-wheel CO_2 (i.e. the amount of CO_2 that they produce compared to conventional gasoline or diesel) is around about 90% less than conventional gasoline or diesel, whereas conventional ethanol or conventional biodiesel, like fatty acid methyl ester, range anywhere between a 20% reduction and a 60% reduction depending on the manufacturing process. The fuels that we are really enthusiastic about are those that offer the potential for a very low carbon footprint combined with the potential for the economics which can be competitive in the longer term. Both the Iogen process and the CHOREN process use feedstock that will not find its way into food. The Iogen process uses straw and the straw, if it was not being used for the Iogen process, would typically be burnt, thereby producing an awful lot of carbon, or ploughed back into the field to be used as a fairly low-grade fertiliser. The CHOREN process uses timber, and that timber would be either harvested from surplus, ie dead trees naturally, or it would be harvested from trees grown for the purpose. The non competition with the food chain is a really important element, because we are already starting to see inflationary pressures in the world commodity markets being brought to bear by biofuel production competing for corn, for vegetable oil, on the world markets, and so we get really enthusiastic about those fuels that have the potential to be very low carbon and not compete with the food chain.

Q302 Lynne Jones: Which of those two technologies do you see having the greatest potential and what proportion of biofuels is produced by these advanced technologies?

Mr Messem: Currently zero, precisely because we are in the process of developing the technologies. One of the reasons why we cannot give you a full production and sales forecast for these technologies is, firstly, because we are developing the technologies as we speak and, secondly, because the market conditions into which those technologies will be brought are not entirely clear to us. Crucially the success of such second generation technologies depends upon the ability to monetise the CO_2 advantage, and currently, with a few exceptions around the world, policy does not enable the monetisation of the CO_2 advantage. What I mean by that is if you take, for example, the UK financial incentive of 20 pence per litre, it is indiscriminate as to whether it is paid for a biofuel that has a zero CO_2 benefit or has a 90 or 95% CO_2 benefit, and so what policy can do is encourage biofuels into the supply chain that are based upon production processes that are not very well understood in terms of their CO_2 impact and draw upon agricultural supply chains that also are not very well understood in terms of their CO_2 environmental impact, whereas what we would like to see is a policy that is based on the certification of biofuel for its CO_2 impact and for the

sustainable development processes that go into its production, particularly in agriculture and manufacturing. To answer your question more specifically, I think both of those technologies have potential. I would say, if anything at the moment, cellulose ethanol is a little bit more advanced in terms of potential, simply because the US Energy Act, which was passed in August last year, puts in place a requirement for cellulose ethanol to encourage its development and the White House has identified cellulose ethanol as one of the technologies that they are keen to see flourish in the US because of the vast amounts of straw production there; so there is a degree of backing for cellulose ethanol that is probably due to the fact that its development is more advanced and there has been work-in-progress for the last 20 or 30 years more than to do with the inherent nature of the chemistry and the technology.

Q303 Lynne Jones: How do the methods compare in terms of their CO_2 emissions? Are they equal in cleanliness, so to speak, and how do they compare with the use of biomass for alternative energy saving methods, for instance for heat or for electricity?
Mr Messem: Both BTL and cellulose ethanol have the potential to be around about a 95% saving on conventional gasoline and diesel. To compare and contrast the two, cellulose ethanol can be blended into gasoline, provided that the vapour pressure of the gasoline is low to accommodate the higher vapour pressure of the ethanol, and that can be used in a blend up to 5%, maybe up to 10%, in existing technologies for gasoline powered vehicles. BTL is a diesel product which can be blended to higher concentrations because it is of a similar volatility and a similar density, and the advantage of BTL diesel compared to conventional diesel is that it is sulphur-free, so it helps with the catalyst treatment of diesel exhaust, gasses and it also, because of its purity, results in lower particulate and hydrocarbon emissions.

Q304 Lynne Jones: Your concern about CO_2 emissions is very commendable, but you have already told us in relation to conventional biofuels that they are too expensive. Fuels from these new technological processes are going to be even more expensive; so what are the price differences and what is it going to take to actually get these technologies off the ground? Last week we were told by the Biosciences Federation, for example, that the cost of the enzymes in the cellulosic process was very expensive and they thought that the Fisher-Tropsch process was actually going to be more of goer in the short-term. What do you say to that?
Mr Messem: The enzymes for the cellulosic process are expensive. The competitiveness of the fuel will depend upon our ability to scale the processes in order to spread the capital cost and get efficiencies in production, and presently that scale-up process is an unknown quantity. We are working on the specifications for the first full-scale production now, and we hope to have that production plant commissioned in 2007 or 2008, and so it is not entirely clear to us yet exactly how the economics of that process will work. It is not necessarily the case, though, that cellulose ethanol will be more expensive. It depends very much on what happens to the world commodity markets and the price for vegetable oil versus the price for the feedstock such as straw, but there is every reason to believe that, as biofuel use increases, there will be considerable pressure on the world agricultural market, and that will result in price inflation for the feedstock which will also push up the price of the food and, in that process, the underlying economics of conventional ethanol will deteriorate. When you compare that against cellulose ethanol that is using straw as a feedstock, there is every possibility that you will not see the same price inflation in straw precisely because there is a much higher quantity of surplus product. We cannot be specific about the precise economics of cellulose ethanol versus conventional ethanol, but there is a scenario in which the world markets push up the price of the agricultural feedstock in the food chain and make conventional ethanol less economical, whereas cellulose ethanol potentially could have a cost advantage because of its straw feedstock. Similarly in BTL, in biodiesel. BTL would not be relying on food as a feedstock. The conventional biodiesels, like fatty acid methyl ester, will draw particularly upon soy or rape-seed oil or palm oil, and we expect there to be price inflation in relation to the supply of those products such that there could be a scenario where BTL is economically competitive because its supply chain does not compete with the food chain. There are many unknowns in this area at present. Shell's position has been that we do not have what we would call core competence or competitive advantage in first generation biofuels. The US ethanol business has been producing biofuels for many years. We do not regard ourselves as having a great deal of core competence or spare capital to allocate to the manufacture of first generation technologies. We do believe that the second generation technologies offer us a potential application for our technology and a potentially better fit for our business model and our sustainable development policy to offer us a business that we can develop in the future, but much of that is dependent upon the world economic markets and also upon the public policy that is put in place to require or incentivise biofuel.

Q305 Lynne Jones: What public policies would help to drive that market forward more rapidly, and what sort of timescale do you think we could optimistically look at having a high proportion, particularly of diesel, from biomass sources?
Mr Messem: Shell, as you know, is working towards the implementation of ethanol in the UK in 2010. In order to do that we need to reconfigure the Stanlow refinery during its planned shut-down period in 2010, and that work is planned to be got underway. To answer your question about the policy, the important issue is how policy recognises the performance of biofuel in reducing CO_2 production. Presently the policy does not discriminate in terms of CO_2 production from biofuel, so it is entirely feasible

that you could have biofuel coming into the UK market that uses agricultural practices that are energy intensive, that uses manufacturing process that are energy intensive and results in a well-to-wheel CO_2 profile that could be, say, 20% better or even zero per cent better than conventional gasoline, and, whilst we are supportive of implementing the Renewable Fuels Transport Obligation in the UK and configuring the Stanlow refinery to enable fuels to make that happen, we think the policy objective for reducing greenhouse gas emissions would be better served by having a certification scheme for biofuels that enables us to really understand what is the CO_2 impact and to enable technologies like cellulose ethanol and biomass to compete on their CO_2 performance.

Q306 Chairman: We are ducking and weaving between our line of questioning, but to follow on from that, the Chancellor announced some measures in terms of enhanced capital allowances for companies who were investing in the way you have described. Are these part of Shell's thinking and do they really make a difference?
Mr Messem: The capital allowances, as I understand it, apply directly to the biofuel producing company. The capital allowance or the capital challenge that Shell has is the substantial capital investment required to reconfigure the Stanlow refinery to enable our fuels to be blended with biofuel. As far as I know, and I would need to double check with the people back at Shell UK, the investment is not directly dependent upon other capital allowances.

Q307 Chairman: Is that because the Iogen link and the Fischer-Tropsch link are not UK based?
Mr Messem: No. The issue for us in terms of implementing biofuel is that we have to reduce the vapour pressure of the gasoline that is produced by the refinery to enable the blending of a higher vapour pressure biofuel with the gasoline so that we still keep the vapour pressure specifications practised in the UK.

Q308 Chairman: I am trying to find out in terms of where you put your investment capital, because you referred to it earlier. At the moment you have got Canada and Germany as sources of second generation fuels. The message I am getting at the moment is that the UK is not going to be a site for such developments in the foreseeable future. The challenge is to deal with the distribution of new fuels as opposed to establishing a manufacturing point for them in the UK. Have I understood it correctly?
Mr Messem: No, I have misled you slightly. I am sorry. Let me try and clarify it for you. Iogen is based in Canada and CHOREN is based in Germany. That is not our preference in terms of manufacturing location strategy; it is simply that is where those companies are based. The technologies could be rolled out to various manufacturing points around the world. We have just completed a feasibility study for an Iogen cellulose ethanol plant in Germany, for example. The factors that are relevant to the industrial location of these technologies are primarily to do with the availability of agricultural feedstock—so straw and timber in the case of these two—the availability of land and transportation at competitive rates and then the availability, if there are any, of capital allowances and helpful economic circumstances for the construction of the project.

Q309 Chairman: Just to be clear, am I right in assuming from that that the United Kingdom does not tick the first two boxes but ticks the third?
Mr Messem: Currently the United Kingdom would be relatively down the list on agricultural supply, simply due to the volume of its agricultural market. It would be less attractive as a location for its financial treatment, it would be relatively attractive in terms of transportation, principally because the population, the demand, is so concentrated and the issue of capital is not so much the capital allowances, although, when you compare the German capital allowances and the US capital allowances, those are substantially more generous for these kinds of technologies.

Q310 Chairman: Than the United Kingdom?
Mr Messem: Than the United Kingdom, yes. The US Energy Act provisions for bio-technology are substantial, because of the size of the economy; so the US is probably the most attractive market in the world at the moment for biofuel technology development. Germany is also an attractive market, for similar reasons, but it also comes to the duty relaxation per litre of biofuel that is put in place. For example, in Germany there has been—and this is not directly relevant to Iogen [It is directly relevant to CHOREN]—a 100% duty reduction for 100% biodiesel over the last few years, and that has encouraged considerable investment in the biodiesel production sector in Germany.

Q311 Chairman: Finally, does the Fischer-Tropsch process lend itself to producing aviation quality fuel?
Mr Messem: Theoretically, yes. Theoretically the Fischer-Tropsch process could produce a BTL kerosene. That is not necessarily compatible directly with conventional kerosene. It would depend on the specification of the product that is produced. Of course, jet fuel (Jet A1) is one of the most tightly specified fuels in the world and is also subject to a host of bilateral agreements, which means, in practice, that whilst BTL kerosene could theoretically be produced, the practical issues of implementing a BTL kerosene in aviation would be immense.

Q312 Mr Williams: You have given us written evidence and also you have told us today of the changes that are going to take place at the refinery in Stanlow, Cheshire, so that you can introduce biofuels into the fuel production there. Can you tell us where you are going to source these biofuels from?
Mr Messem: It is a very good question and one that is vexing the minds of a number of people in Shell at the moment. The installed capacity for ethanol in the UK is, I understand, zero. The installed capacity for

biodiesel in the UK is a little bit higher than that at a couple of hundred thousand tonnes. The Road Transport Fuel Obligation for biofuel is substantially in excess of the UK's installed capacity to produce the product; so it is almost inevitable that there will be imports into the UK market to meet the requirement that has been set out. Clearly, you would expect, if there is a mandated requirement, that would encourage investment into biofuel production, and we are starting to see interest in manufacturing capacity, but my experience so far is that the major part of the interest is in basing manufacturing capacity in lower-cost economies and importing the product into the UK. It is still unclear to us where all of this biofuel will come from, and we are working with the industry to figure out the most advantageous supply points. The issue that concerns me most with regard to supply is that, again, the policy does not discriminate in terms of the sustainability for the CO_2 footprint of the biofuel that is implemented and typically it is the simpler, lower-cost production technologies that will be encouraged to the market fastest, and typically it is those that will have the worst performance in terms of CO_2, and so part of our challenge is to make sure that we choose a supply infrastructure that not only can provide a fuel which is what the RTFO calls for but can also provide that fuel in a sustainable environmentally friendly way. Our strong preference is, of course, if we are implementing biofuel, to implement biofuel that is good for the environment not biofuel that is not so good for the environment, and that remains a significant challenge for us going forward.

Q313 Mr Williams: We have been told by other people that there is enough surplus wheat production in this country to produce all the bioethanol that is required and enough set aside land so that rape could be grown to produce the biodiesel, but from the comments that you are making it does not seem likely that the production of biofuels is going to take place in this country, it is going to take place in lower-cost economies?
Mr Messem: I have read the reports also that say that there is sufficient surplus biomass production and sufficient agricultural potential for the biomass production. I am not an expert in that area, but I have every reason to believe the reports that have been put in front of you, though the projected outcomes of those reports vary dramatically; but even if you assume that the UK can produce sufficient biomass, the challenge remains to install the productive capacity to convert that biomass to the fuel that we need in an economic and in an environmentally sustainable way, and it is that productive capacity that has yet to be built. Theoretically, the productive capacity could be built in the UK, but I think manufacturers will look at the cost of production verses the cost of transportation and, as we are seeing in many products around the world, often the cost of production is better served by being located outside of the UK and the products transported to the UK for consumption. Biofuel will be a relatively high value but also heavy product, and so there are transportation penalties, but we already are seeing Brazilian ethanol being transported to Europe as a refined product and so there is evidence in the market that transportation economics for biofuel do work in favour of importation.

Q314 Mr Williams: But I gather from what you are saying that Shell is not interested in producing these first generation type fuels?
Mr Messem: No, I would not say that Shell is not interested. We continue to monitor the situation and review our strategic options, and to date it has been possible to meet our requirement from available production in established markets by established producers such that we have not been required to divert capital from our core business to the development of a first generation biofuel business. That said, I would ask you to keep in mind that in 2005 we spent in excess of $1 billion on biofuel procurement and development, and that is a substantial investment for any company of any size, and the availability of capital, even within a company the size of Shell, is finite and so we have to choose where best to deploy our resources. We continue to keep open the option of investing in first generation biofuel manufacture because clearly we need supply security, just as the country needs supply security, but we continue to focus heavily on the advantages of second generation technologies and we hope that the market conditions will enable the introduction of those technologies in due course. My biggest fear in that regard is that the policies that do not discriminate between CO_2 performance of biofuel will encourage first generation technologies to such an extent that they lock the market out for second generation technologies because the first generation technologies are in there first, and that would result in a less than optimal CO_2 benefit for the supply of biofuel.

Q315 Mr Williams: One of the other things that we have been told is that the key to reducing the carbon output, as far as biofuels is concerned, is that you have short supply chains, but you are telling us that the cost pressure will be such that it will be more economic to import biofuels from lower-cost economies than to produce it closer to where it is needed?
Mr Messem: One of the difficulties of the biofuel market is that biofuels are encouraged because the perception is that they will reduce CO_2 emissions. In reality, the consumption of biofuel in your vehicle produces as much CO_2 from the tail-pipe as conventional hydrocarbon fuels. You are combusting the hydrocarbon. The benefit from biofuels comes purely from the plants sucking the CO_2 from the air, as you clearly know, but then some of those benefits are lost through the agriculture process that employs conventional energy and pesticides and manufacturing processes that employ conventional energy. A further component is lost in the manufacturing process for biofuel and the final component is lost in the transportation and distribution. Hence some biofuel components have a

marginal benefit in terms of CO_2. In order to maximise the CO_2 benefit, ideally what you would want to see is domestic agricultural production, domestic manufacture of biofuel and minimal transportation distances, but, of course, that would need to be factored against the cost of production and the cost of transportation.

Q316 Mrs Moon: That was extremely interesting. It brings me on nicely to the issue of the Carbon Assurance Scheme. You have talked about issues of sustainability and English Nature, in its presentation to us, has talked about sustainability and safeguarding biodiversity in the wider environment. You have talked about not tackling and getting into competition with the food chain in this country, but then you are talking about the new biofuels actually losing some of their carbon saving in the processes, because you are talking about the transport costs of bringing production in from abroad, you are talking about the manufacturing implications as well as what happens when the fuel actually gets into the tank. English Nature has suggested to us that the allocation of Renewable Transport Fuel Certificates should be linked with greenhouse gas savings. You said that there are actually marginal benefits in terms of CO_2 reduction. Those are the words you have just uttered. Do you agree with English Nature and what do you think would be the advantages and disadvantages of linking that certification scheme to actual reduction in CO_2?
Mr Messem: I am sorry if I am confusing you slightly. The circumstances under which biofuel is marginal to CO_2 is where the process from agricultural feedstock through to the end user uses industrial methodology and conventional fuels heavily in the production process. For example, if you look in the Concawe analysis of the well-to-wheel performance of biofuels, some ethanol from wheat is a 70 odd per cent reduction in CO_2, some ethanol from wheat is a 10% reduction in terms of CO_2, and that is dependent upon the region and the process that is producing them. It is not that you can say that any one biofuel has a particular carbon footprint; it very much depends on the process that is used to produce. To me English Nature have a very strong point, which is that the certification needs to be linked, not just to the fuel but also to the production process and to the production process for the agricultural feedstock that goes into that supply chain. Only by validating the CO_2 performance of the agriculture, the manufacturing and the distribution could CO_2 certification be substantially achieved. Clearly there would be a cost to that in terms of manpower and bureaucracy to manage that scheme, but I think there is enough evidence in the CO_2 analyses for biofuel to indicate that biofuels are not all the same in terms of their CO_2 performance and some way of identifying the good from the less good is very important. I have some sympathy with the position that English Nature have represented to you.

Q317 Mrs Moon: You think it would have advantages. What would be the disadvantages?
Mr Messem: Of such a certification scheme?

Q318 Mrs Moon: Yes.
Mr Messem: Principally that it would take a substantial amount of resource to manage and to police that scheme, given that the well-to-wheel analysis is a complex science and that the biofuel industry is very fragmented. Therefore, there would be a considerable number of agricultural production points and biofuel production points that would need to be assessed in that process, and so that would inevitably create a cost, the cost would have to be borne somehow, either by the private sector producers or by the public sector administrators or supervisors of that process, and, therefore, I would imagine that it would bring a cost and complexity to the industry for which ultimately the consumer or the industry would end up having to pay.

Q319 Mrs Moon: So we could find ourselves pursuing a process that, at the end of the day, unless we monitor very intensely, brings very few CO_2 reductions?
Mr Messem: Yes, and I think that is the major reason why you probably perceive that the energy industry has been relatively slow in the take-up of these technologies. If I can go back to the question Mr Jack asked at the start in terms of what is holding us up, I mentioned there is not a consumer demand for biofuel. Our market research suggests that consumers certainly do not expect to pay a premium for this product even though it costs substantially more to produce than conventional gasoline or diesel. Secondly, the energy content of biofuel is lower, the combustible energy content in joules of ethanol is about 60 or 70% that of conventional gasoline, which means less miles per gallon and less performance from your car, and, as we know, consumers tend to like miles per gallon and performance. The processes are not particularly scaleable, such that it is difficult to achieve the kind of through-puts that you achieve in the conventional refinery in order to bring the unit costs down, so it is difficult to see how, on a unit cost basis, biofuels will ever be completely competitive with conventional hydrocarbon fuels, and, in addition to that, the policy environment typically is only secure for about three or four years. The UK RTFO talks about a framework in place for 2009, but when you build a capital intensive plant like an ethanol plant, you have to take a 25-year view on its economics and its lifetime, and if the financial incentives for the product disappear after three years and you are left with a product that costs more to produce than conventional gasoline, then the business case for that investment is hard to substantiate, and so there are these three or four major impediments to investment in biofuel technology that really are difficult for the industry to overcome and, therefore, to put forward a strong production investment schedule.

Q320 Mr Rogerson: Very briefly, talking about the certification process, following the brief discussion that we have had on transport and the distance that fuels would have to travel before they reach the consumer, do you think that should be factored into that certification process?
Mr Messem: The transportation of the fuel?

Q321 Mr Rogerson: As in where it is produced.
Mr Messem: Yes. It should be factored in, simply because the transportation of the fuel consumes energy, therefore incurs cost and, therefore, produces additional CO_2. As I said, the issues with biofuel are that the energy content is lower; the CO_2 performance is variable, so that those transportation issues affect the performance of the biofuel on that basis. The other concern to watch out for is that the actual energy creation process for biofuel is very variable as well. If you produce a litre of ethanol, its energy content is already 70% of availability on your gasoline but you have also got a relatively energy intensive process to produce it. Hence the Concawe Report believes that some biofuels do not even result in net energy creation; so it is really important that we have a process that discriminates between biofuels that are working towards your policy objectives and biofuels that are not.

Q322 Mr Rogerson: I understand that. What I am saying is if we are going to take into account the energy use of getting the fuel to where it is going, then it is not just that Shell has a product that you can buy from a pump and it should be certificated at this level, it is also the fact that this bit was produced in Africa, this bit was produced in Asia, and it is how you account for that as well?
Mr Messem: I do not think the issue is so much where exactly it is produced. Shell has learned over the last 100 years that an open and free market in energy is the best way to drive down the production costs and get efficiency in the energy system, and I think that would be true for biofuel production as well. I think the important thing is to make sure that it is clear what is the CO_2 footprint and what is the energy creation in the biofuel process in order to be sure that when you mandate biofuel in order to reduce greenhouse gases that is what is actually being delivered.

Q323 Lynne Jones: I was very struck by what you said earlier that without a Carbon Assurance Scheme there was a danger that you would lock second generation technologies out of the market. The Government has said in its evidence to us that they are going to produce a Carbon Sustainability Assurance Scheme, but how urgent is that? If it takes several years to get to that stage, will we, before we have developed that assurance scheme, have locked the second generation technologies out of the market and is it sufficient for it to be just done with a British scheme or do we need international agreement on this?
Mr Messem: I think it is very important that the scheme is as consistent as possible internationally, for two reasons: (1) there will be immense complexity in the supply chain if we have different international standards, (2) I think the efficiency of the energy system would be encouraged by having open international markets; so the more consistent the policy the better. In terms of its urgency, I think there is an urgent requirement for it, because at the moment there is biofuel production capacity being planned and biomass production being planned without, I think, the necessary regard for the CO_2 impact of that production. If the ultimate aim of the policy is to reduce greenhouse gas emissions, I think it is important that the variability inherent in the process is somehow measured and managed such that we are clear that we are getting carbon reduction.

Q324 Lynne Jones: Would it not be counter-productive to be requiring a Renewable Fuel Obligation without a Carbon Assurance Scheme? Would it not be better to wait until you have got a Carbon Assurance Scheme to really go, hell for leather, for biofuels?
Mr Messem: It could be counter-productive. It will certainly be less optimal than it could be, even if it is not counter-productive, precisely because, if there is a mandate for biofuel and if demand exceeds supply such that there is a big incentive to get involved in biofuel production, the easiest way to meet that demand is to go for the simplest, most readily available technologies, which also are likely to be the most energy intensive and most carbon producing technologies. The Iogen process, by way of example, is an advanced process that uses enzymes that have been specially bred for the process of extracting cellulose from straw, and that uses advanced bio-technology to do a job which otherwise you would have some form of heat treatment process to do. There is a substantial difference in the technologies and there is potential to use this kind of technology to develop very low-carbon fuels, potentially even carbon neutral fuels, but at the moment, if there really needs to be a rush to implement biofuel, that kind of technology does not stand much of a chance because you can produce ethanol the Iogen way or you can produce it the conventional way, and the conventional way is more energy intensive and you will have more CO_2 production in that process than the Iogen way. I think there is very much a risk in what you are describing.

Q325 Chairman: Can I ask Ms Morrison a question. Annually Shell sends in a report on its CSR responsibilities on a world basis. We have just been talking about sourcing biofuels from external sources outside the United Kingdom. What is Shell's policy with reference to (I think a point that Mr Rogerson touched on) the impact on biodiversity, for example, of sourcing from parts of the world where sustainability may not necessarily be at the top of the agenda?
Ms Morrison: As Darran said earlier, we do support having an international market. We have a biodiversity policy, and I can send it to you.[1] It is one

[1] Ev 133, para 9

of the issues we are looking very carefully at and we are looking to work with others to maintain eco-systems, working with NGOs and other stakeholders to discuss how that can be done. There is a lot of work going on.

Q326 Chairman: By all means write to me, but to follow on Lynne Jones' line of questioning, just as you were talking about having a tough certification scheme from well-to-wheel, should such a certification scheme also incorporate some requirements from the supply side over questions of sustainability and biodiversity?
Ms Morrison: Yes. I think some of the work that we have seen that is starting to be developed by the Low Carbon Vehicle Partnership is looking at that as well as the carbon footprint; so that is something that is being brought to bear.
Chairman: I think it would be helpful if you could expand your thought pattern on that, because it is an issue that has been raised and which one would like to explore further.

Q327 David Taylor: It is a pretty profitable process at the moment, is it not, turning to oil production?
Mr Messem: Some aspects are, some aspects are not. There is a lot of variability in the markets, both on the oil industry side and on the biofuel industry side, that makes the returns volatile and unpredictable.

Q328 David Taylor: It is pretty good at the moment?
Mr Messem: It is currently good for ethanol production.

Q329 David Taylor: What about in the wider sense?
Mr Messem: There are areas where there are pressures in terms of post refinery distribution. The downstream businesses worldwide have come under pressure in a number of areas, but, broadly speaking, the last two years have been reasonably good in terms of the oil industry, the energy industry. If you look at the comparative analyses on economic returns that have been done by magazines like *Fortune* and *The Economist*, for example, Shell's return on capital is still around 15% and our return on sales is around 7%, which, relative to other industries, is not a particularly exceptional performance.

Q330 David Taylor: You made a particular point earlier in that you had spent a billion dollars on biofuel components. What is your aggregate global revenue approximately?
Mr Messem: Our aggregate global revenue. I would need to check it. I cannot give you an exact figure. It is right to say that biofuel—

Q331 David Taylor: No, in aggregate terms for all fuels?
Mr Messem: Biofuel is less than 1% of the fuel that we sell. I cannot tell you what it is as a percentage of revenue.

Q332 David Taylor: I was trying illustrate that one billion pounds might be such a tiny proportion of the revenue costs that the company has?
Mr Messem: It is a small proportion. Our total capital budget was in the order of about £15 billion last year, but the one billion is a combination of product spend and capital investment.

Q333 David Taylor: A cynical environmental observer might think that some of what you are doing is just window-dressing and you are not serious about it. You have described the constraints—the financial ones, the economic ones, the energy constraints—and I understand all of that, but it is an extraordinarily slow process, is not it? The global environment cannot wait for companies like your own to start to deliver a much higher proportion of fuel in alternative, more satisfactory forms. One per cent. You have, therefore, a global market of about 250 billion litres of various fuels primarily. Is that right? You have said that 1% is two and a half; that is 250, is it not?
Mr Messem: Yes. It is potentially greater than that now.

Q334 David Taylor: I am going to come to the point about how we encourage the demand that you have identified as one of the things which was in short supply. Here in the UK, I think we have a road fuel usage of about 60 billion litres per year, 150 million of which are biofuels, less than one quarter of 1%. We have to accelerate the process more substantially than that. Shell made the point in its submission that you would want to see a substantial increase in the present duty derogation incentive, which is 20 pence per litre. You suggest 40 pence, but you do acknowledge that that would have a fiscal burden and you observe that some other mechanism for enabling biofuels to be economically competitive may need to be found. What mechanism do you have in mind, bearing in mind all the questions and constraints and burdens that you have painted in your submission and in your evidence so far?
Mr Messem: Let me try and respond to your questions with specific numbers that I can share with you, because I have them here. The UK market volume of transportation fuel is 120 billion litres and of that currently 0.3% is biofuel. Currently the UK spot-price for gasoline, before you do the distribution and the marketing of it through retail outlets, is about 30 pence per litre. The European spot-price for ethanol is anywhere between 35 and 38 pence per litre; so you have got a five to eight pence per litre difference just in terms of the unit cost of the fuel. Bear in mind that the unit energy content of that fuel is 60% of the gasoline.

Q335 David Taylor: I hear what you say.
Mr Messem: From a consumer point of view you would be paying more for less, and that indicates a significant barrier to implementation. From our point of view, in order for there to be a sustainable growth in the use of biofuel, that cost and energy barrier somehow needs to be overcome in the minds of consumers and producers, and that is why we said

we feel that there needs to be a substantially greater duty reduction on biofuels to encourage their use. For Shell to be able to implement more biofuel, we have to reconfigure the Stanlow refinery, reconfigure the Stanlow distribution terminal and reconfigure the Jarrow distribution terminal.

Q336 David Taylor: I understand all of that—I am sorry to interrupt—and I understand these are serious and significant technical hurdles, but you say elsewhere in your submission, almost with relish I am tempted to observe, that it would be decades before it will be possible to have an economically efficient internal combustion engine using biofuels on any great scale, but we cannot wait that long, can we?
Mr Messem: The issue with the internal combustion engine—I am sure my colleagues from Ford can represent this much better than I can—is that currently all of the engines driving around the UK are ill-equipped to accommodate any fuel that contains much more than 5% biofuel. The ethanol is more corrosive and tends to have an impact upon the elasto-sealant and biodiesel tends to result in formation build-up deposits which can be damaging to engines, and so, if we want to just implement biofuel in current engines, we are really looking at a 5% blend as a maximum. In order to move to a higher concentration of biofuel, we either need to have engines that are built for that purpose, and they are typically called flexi-fuel engines (and this is what we have had in Brazil and we are starting to in see more of in the US for ethanol) or we have to have advanced technology fuels, such as BTL[2], that can be used in conventional engines at higher concentration. Typically a car in the UK will have a lifespan of around about 12–15 years, and so, if we want to have all vehicles running on more than 5% and to do that with conventional biofuels, we have to enable the car fleet to turn over, and that is going to take something in the order of 15 to 20 years to do. It is not Shell or the energy industry that is presenting that constraint; it is simply the practical reality of nearly 25 million vehicles on the road at the moment and they are not going to run on biofuel concentrations greater than 5% very easily.
David Taylor: But they are producing about a quarter of our carbon emissions and they are currently failing to deliver significant reductions terms of carbon emissions. I am going to pass over to you, Chairman.

Q337 Mr Drew: Can we look at the issue of the hydrocarbon economy and, moving towards that, perhaps I can use the analogy of the vaccination for bovine TB: it seems to be 10 years away! Can we, firstly, deal with what I know you are going to tell me is a great myth: the patent for electric or hydrogen fuel cell cars are held by the oil companies. That is a great myth, is it?
Mr Messem: To be honest, I cannot answer that question. I do not know. I will check it as soon as I get back.

[2] Biomass-to-Liquid

Q338 Mr Drew: You are worrying me now!
Mr Messem: Shell has been working on hydrogen fuel cell vehicles for the last 40 years—I know that that for a fact—and the technical and practical challenges to introducing a cost-effective and economically viable hydrogen fuel cell vehicle are enormous.

Q339 Mr Drew: Is that simply the reason why we are not there? According to the figures from the World Business Council of Sustainable Development, by 2025 fossil fuels will still be 60% of the transport fuel total, which is a bit depressing. This is not really a paradigm shift in proportions, is it?
Mr Messem: Again, the people from Ford are probably better placed to answer this, but I can try and answer the question to the best of my knowledge. The hydrogen fuel cell vehicle depends on two key things happening. One is the development of a drive train technology that can deliver the kind of range and performance that customers expect when they are paying $20,000 for a vehicle. The second is that there needs to be a fuel supply chain that can deliver the fuel energy competitively and practically, and the fuel side of it really comes down to two issues. One is the only practical way currently of producing hydrogen for transportation is from natural gas, and that is a process of conversion which inevitably is more expensive than producing hydrocarbon liquid fuel from crude oil. Secondly, if you want to do it any differently and get to a renewable hydrogen we need to find a process that is both technically and economically feasible, and currently there is not a clearly identified process able to produce renewable hydrogen in sufficient scale at a low enough cost to be practical.

Q340 Mr Drew: Is that because the scientific knowledge about how you would break down the molecules of water are really deficient, or is the nuclear route something again that you are interested in? We have to take one of these routes, surely.

Mr Messem: It is a good point. Nuclear hydrogen would be a third potential pathway. Shell is not a nuclear energy company; we do keep a close watch on the nuclear industry and our strategic options in that area, but to date it has been an area of energy that we have determined not to invest ourselves in. It poses a number of issues, obviously, in terms of the perception and the perceived safety of the process, together with the capital cost and the economics of the nuclear industry. Coming back to your question, though, about why is this, in many ways it comes down to thermodynamics and chemistry. It is a simple scientific fact that separating the hydrogen from the oxygen in water requires an immense amount of energy to do it, and separating the hydrogen from a hydrocarbon chain or any other molecule that it is attached to requires an awful lot of energy, and processes requiring immense amounts of energy and conversion tend to be expensive.

Q341 Mr Drew: So coming to this idea of 2025, we are still very heavily dependent on fossil fuels, is that your prediction, then? Or could we go more quickly towards biofuels and hydrogen fuel cell delivery?

Mr Messem: I am in the privileged position of being able to talk to many car companies around the world, if not all, and my understanding, having spoken to many car companies, is that the commercial scale roll-out of hydrogen fuel cell vehicles is in the order of 15–20 years away, and the reason for that is that the technology development process in order to produce a viable hydrogen power drive train requires that kind of development lead time. The only other constraint on that as an economic constraint is inevitably that the automotive industry has billions of dollars in invested capacity producing internal combustion engines, and internal combustion engines therefore are being produced very economically, very cost competitively, and new technology will somehow have to compete when the motor vehicle is a consumer purchase and a consumer investment, and I think that the car industry struggles with the fact that if you want to produce a vehicle that can propel 4–6 people from 0–60 in 10 seconds and have a range of 300 miles and do all of that carrying a CD player and all of the mod cons that cars now have, and to produce that at a list price including tax and duty of around £10–£15,000, that is an immense technical and manufacturing challenge, and to do that then with a whole new drive train technology and to do it competitively is a huge challenge. So practically it seems that the hydrogen fuel cell vehicle as a large scale mass production transportation system is a number of years away. Therefore, practically, the most practical route to renewable fuels in transportation is to look at biofuel and, as I have said, because vehicles on the road can run at blends of 5% biofuel the most practical thing to do is to blend biofuel in low concentration blends with conventional hydrocarbon. That is the most practical way of addressing the challenge today, given that there are 25 million vehicles on the road that require a hydrocarbon fuel and cannot accommodate a biofuel blend much above 5%.

Q342 Mr Vara: Very briefly, is it not in your company's interests not to have hydrogen fuel, and you give the argument that if you had actually put the investment in there then you might be able to get that car for about £10–£15,000 rather than the million pounds it costs at a moment, which we found when our Committee went to Sacramento.

Mr Messem: In the long term, no. Shell is an energy company and has been for the last 100 years, and in that time we have been the leader in fuel development over the course of 100 years and we intend to be around for the next 100 years, and therefore it is in our interests to develop energy technologies that are cost effective and commercially viable, and that is why we focus on the advance technologies that we do.

Chairman: Thank you very much indeed. That was fascinating and interesting and I look forward to your further observations about CSR sustainability and biodiversity. Thank you very much not only for your evidence this afternoon but also your written submissions. Thank you.

Supplementary memorandum submitted by Shell

RENEWABLE ENERGY: THE ROLE OF BIOENERGY

1. Thank you for your letter of 18 May 2006. Please find below further information on Shell's biodiversity policy as well as further information in relation to some of the queries raised during our evidence session. Following our oral evidence given on 3 May 2006, I am writing to you to respond to some of the queries raised by the Committee and to outline further some points discussed during the session.

Future of hydrocarbons

2. Mr Jack had asked about Shell's views on the run down of hydrocarbons and plans we have to replace them. As we set out in our response, Shell considers that fossil fuels will continue to be at the heart of the energy mix for decades to come. Shell does not consider that the world to be running out of oil and gas. However, most easy resources have already been brought into production. So future production will come from developments that are less easy to produce or in harsher conditions, including unconventional resources.

Hydrogen and patents

3. Another query was in relation to patents held by Shell on hydrogen and our use of them. We do not hold patents in the field of electric or fuel cell vehicles, as this is the business of the car manufacturers and/or their equipment suppliers. However, we do work with these companies to research optimum solutions of dispensing and storing H2 in the fuel cell car.

4. Shell does hold patents for the manufacturing, distributing and retailing hydrogen, i.e. the whole chain of making hydrogen, bringing it to the customer and supplying it to the customer. These patents deal with new, innovative technologies in the above pictured value chain, which will give us a clear competitive edge, once a hydrogen economy rolls out. Patents are dealing with both applications of hydrogen in the transportation sector (hydrogen as a future, clean fuel) and in the stationary power sector (production of clean power).

5. In order to build experience with hydrogen infrastructure and hydrogen operations in close interaction with customers, we involved in various demonstration projects Shell is the only major energy company involved in fuel cell vehicle demonstrations in all three major hydrogen markets—Japan, North America and Europe. We have opened hydrogen stations in Tokyo, Reykjavik, Amsterdam, Washington and Luxemburg.

Corporate Social Responsibility (CSR) and Biodiversity Standard

6. Shell recognises that our business success depends on acting with respect for people and behaving responsibly towards the environment. We comply with all applicable laws and regulations—that is our baseline. We are committed to contribute to sustainable development and as a socially responsible corporation we often go further than laws and regulations to manage the potential social and environmental impacts of our operations.

7. Shell's Biodiversity Standard recognises the importance of biodiversity. We are committed to:

— work with others to maintain ecosystems

— respect the basic concept of protected areas

— seek partnerships to enable the Group to make a positive contribution towards the conservation of global biodiversity

8. Shell companies will:

— conduct environmental assessments, which will include the potential impacts on biodiversity, prior to all new activities and significant modifications of existing ones, and

— bring focused attention to the management of activities in internationally-recognised "hotspots", including the identification of, and early consultation with, key stakeholders.

9. I have enclosed copies of Shell recently published Shell Sustainability Report which sets out further information.[1] In addition, further detailed information on Shell's biodiversity policy is available on our website at www.shell.com/biodiversity.

10. The feasibility study on the Renewable Transport Fuel Obligation (RTFO) carried out for the Department for Transport highlighted the need to ensuring this scheme did not lead to detrimental environmental impacts. With financial support from Shell and other partners, the Low Carbon Vehicles Partnership (LCVP) has commissioned research into the development of environmental standards for biofuels. This research is covering a wide range of issues including maintenance of ecosystems and biodiversity. Discussions have already begun on how such a scheme can be implemented in the UK as part of the RTFO.

UK External Affairs Manager
Shell

June 2006

[1] Not printed

Memorandum submitted by Ford Motor Company (Bio 24)

Ford Motor Company in Britain

1. Ford Motor Company (FMC) welcomes the opportunity to submit written evidence to the House of Commons Environment Select Committee's inquiry into bio-fuels.

2. FMC is one of the world's largest vehicle manufacturers. Its automotive brands include Aston Martin, Ford, Jaguar, Land Rover, Lincoln, Mazda, Mercury and Volvo. FMC celebrated its 100th anniversary on 16 June 2003. FMC group companies in Britain employ around 33,000 people—approximately 45% of all Ford Motor Company employees in Europe. Close to 21,000 of these people are employees of Jaguar, Land Rover and Aston Martin.

3. Four Ford Motor Company brands build vehicles in the country—Ford "Blue Oval", Jaguar, Land Rover and Aston Martin.

4. The Bridgend and Dagenham Engine Plants also build petrol and diesel engines for Ford, Jaguar and Land Rover products. In addition, Mazda and Volvo have sales organisations in Britain, and Ford Financial Europe—Ford's financial services organisation—is headquartered in the UK.

5. FMC group companies operate around 30 facilities in England, Wales and Scotland. A third of Ford's European spending, and over two-thirds of Jaguar and Land Rover's total spending is in Britain. In total, Ford Motor Company spends around £8 billion in the UK each year. Jaguar and Land Rover are among the country's largest exporters to the United States market.

Ford Motor Company on Climate Change

6. At Ford Motor Company we have long acknowledged the importance of climate change. We recognise its potential impact on economic as well as environmental and social systems. We also accept the need to intensify our efforts is even more urgent. We have arrived at a critical point, and we need to act today to safeguard the future.

7. Climate change is a critical business issue and addressing it represents a major challenge involving numerous actors. It also represents an opportunity for companies that can bring fresh thinking and technological and social innovation to the challenge.

8. Ford Motor Company is investing in a broad range of product technologies to reduce CO_2 and has already made significant strides.

- In 2004 in the US, which unlike Europe is not a diesel market, we launched the world's first SUV hybrid. We plan to introduce four further hybrid vehicles within the next three years and recently committed to having available for sale globally up to 250,000 hybrids a year by 2010.
- In Europe, Ford has led in developing clean diesel technology which already offers a cost/benefit for the customer that is comparable to gasoline hybrids.
- Ford is investing in R&D to develop hybrids in Europe, and especially in diesel micro-hybrids which seem well-suited to the European driving environment.
- In addition we are actively pursuing a range of other technologies which can deliver a significant fuel economy improvement such as weight reduction and highly efficient gasoline engines.
- Flexible Fuel Vehicles (FFV): Ford has sold over 1.5 million worldwide. In Europe, the Focus FFV is now available in Sweden, UK, France, Ireland, Austria and Germany. Spain, Italy and the Netherlands will be added during 2006. Volvo has launched FFV versions of their S40/V50 in some European countries.

9. Ford has also made substantial progress in reducing emissions and energy usage from our manufacturing processes.

An Integrated Approach

10. The report from the CARS21 multi-stakeholder process concludes that an *Integrated Approach* will deliver greater CO_2 savings than a vehicle technology-only approach and that it will do so more efficiently and cost-effectively. The premise of the *Integrated Approach* is that all stakeholders must play their part—industry, consumers and regulatory bodies will have to work together in an unprecedented manner.

- The automotive industry and its suppliers must further increase market penetration of CO_2 efficient technologies.
- The fuel industry and automotive sector must further increase the market penetration of alternative fuels through a substantially increased offer in accordance with the EU bio-fuels directive, easier availability and enabling vehicle technology.

— Policy makers must set the right regulatory framework through intelligent legislation/taxation, improve road and traffic management infrastructure (for example, traffic light synchronisation has the potential to achieve a 2.5Mt CO_2 reduction) and provide R&D support for vehicle technologies and alternative fuels.

— The automotive industry, fuel industry and policy makers must work together to support eco-driving activities.

— Changes in consumer purchasing and driving patterns can also play an important part in reducing CO_2 and could, for example, achieve a 20% fuel consumption reduction potential through adaptive driving behaviour, optimised gear shifting and efficient acceleration.

11. The automotive industry will retain a central role, but success in reaching the ultimate CO_2 reduction goal will depend upon our success in implementing the integrated approach.

12. It is important to recognise that there is no single solution. Policy principles to achieve CO_2 reduction, in the short and long term, need to create synergy among solutions. They must also be coherent and consistent in their application. There needs to be a focus on vehicle and fuel environmental performance as opposed to type of technology to allow for development of numerous solutions that should ultimately produce vehicles and fuels with lower CO_2 impact. Government policy must be primarily concerned with outcomes and not the technologies used to deliver those outcomes. Debate should focus on the appropriate balance between actions to influence outcomes; to encourage the development of technological solutions, consistency over the longer timescales required to bring about significant and lasting change, and the regulatory conditions which can allow technologies to flourish, based upon performance. Consumer behaviour changes based on choices will be the ultimate outcome.

The Role for Bio-fuels

13. Just as vehicle technologies are evolving, so too are fuel technologies. The key measure of performance for fuel technology should be grams of CO_2 emitted per kiloJoule of energy released. The CO_2 emissions per kilojoule should be calculated on the basis of total CO_2 emissions in the value chain. Within that context, bio-fuels have an important contribution to make in reducing CO_2 emissions and in reducing the UK's dependency on imported energy. Current bio-fuels can contribute to a 30–50% reduction in Well-to-Wheels CO_2. [The Well-to-Wheels approach takes into account not only the CO_2 generated by the fuel's combustion, but also that generated/absorbed by fuel's production]. Second generation bio-fuels from wood and wastes improve this further to 80% and 90% for bio-ethanol and bio-diesel respectively. We believe that there is a significant potential for second generation bio-fuels (wood/ligno-cellulosic) which promise to achieve "well-to-wheel" CO_2 emissions close to those of the even the most optimistic hydrogen fuelled propulsion systems.

14. We further believe that fuels which are compatible with the existing car parc and fuel distribution infrastructure will ultimately offer even more potential than those which are incompatible, such as E85, but recognize that these fuels are not yet available.

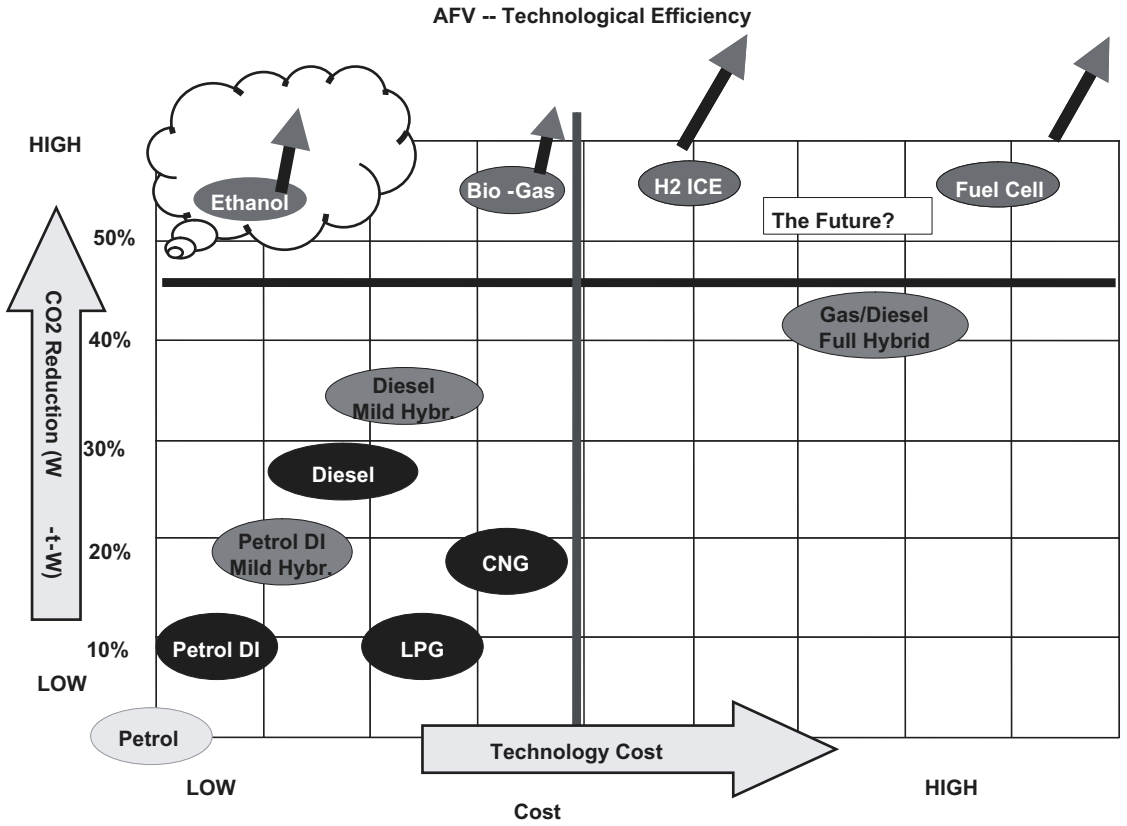
15. In the meantime, to start taking advantage of presently available bio-fuels, in 2001 Ford recognised the opportunity and support for renewable fuels in the Swedish market and launched the Focus Flexi-Fuel Vehicle. This car can run on a high-blend bio-ethanol (E85, ie 85% ethanol, 15% gasoline) or conventional gasoline or any combination of the two fuels. This has effectively future-proofed the technology and enables flexibility in the future bio-ethanol content of gasoline. In 2005, 90% of all the Focus vehicles sold in Sweden were FFVs, a total over 15,000 FFVs have been sold and more than 60% of FFVs are bought by retail customers. By 2008 we project 25% of new vehicles sold in Sweden will be capable of running on E85. In 2006 new car sales in Brazil are likely to rise to 80% FFVs.

16. Unlike other bi-fuel technologies which require two fuel tanks there are no such compromises for the customer. The Focus FFV has the same power output as the conventional 1.8 litre gasoline, with equal acceleration and top speed. As bio-ethanol has 30% less energy than gasoline the vehicle will operate at typically 30% less mpg than conventional gasoline.

17. In addition to significant Well-to-Wheel CO_2 reductions the Ford Focus FFV has substantially lower regulated emissions than current regulated requirements and therefore contribute to improvements in urban air quality.

18. All this is achievable at a product cost broadly comparable with mainstream gasoline products. This is the only alternative fuel or alternative powertrain vehicle that can make this claim.

Chart 1: Technological Efficiency of Alternative Fuels



19. Ford Motor Company is working with Local Authorities to assist establishment of a bio-ethanol infrastructure. Somerset Council has created a buyers consortium comprising of the Council, Avon and Somerset Constabulary, Wessex Water and Wessex Grain. The project will establish five E85 pumps in major towns in Somerset. Initially the E85 will be sourced from Spain, to be quickly replaced by fuel from the GreenSpirit bio-ethanol plant using UK wheat. Ford will supply 300 Focus FFVs to the project over a three year period. Other Councils in the South West and East Anglia are also expressing interest, and interest is rising on a weekly basis.

Specific Questions

20. *Ford is principally concerned with the use of bio-fuels for road transport and has responded to questions relating to that issue.*

Q1. *What is the real scope for biomass and bio-fuels to contribute to tackling climate change? What proportion of the UK's energy and transport fuel needs could they provide?*

I. We estimate that more than 25% of personal mobility fuel demand could be satisfied by fuels derived from bio-mass. This is based on second generation bio-fuel technology.

II. Ford Motor Company believes that bio-fuels can play a significant role in tackling climate change. When produced with a focus on CO_2 reduction, bio-fuels offer the potential to reduce CO_2, on a Well-to-Wheels (life-cycle) basis, of up to 80%.

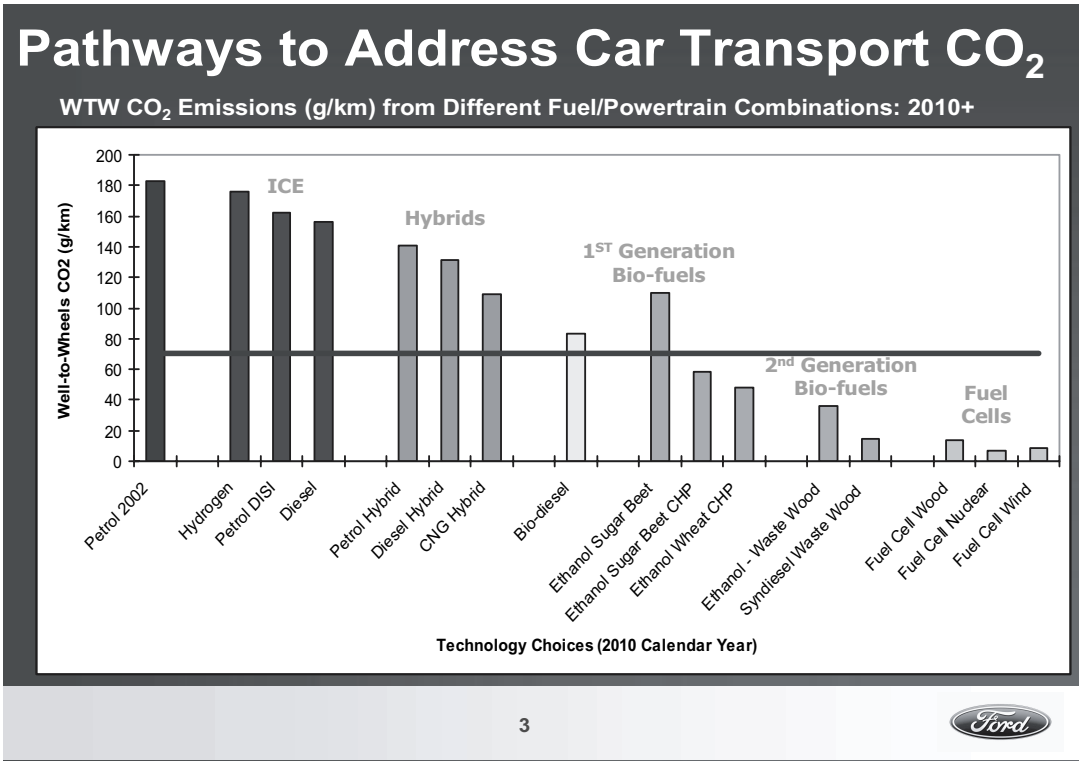
III. No other technology which is available today or in the very near future can achieve a CO_2 reduction of this magnitude. (See Chart 2.)

IV. We welcome the Government's interest in encouraging the increased availability of renewable fuels for personal transportation. However, we recognise that fuel technology is evolving and we believe that fiscal policy and incentives should be based upon the development of fuels with better CO_2 performance, based upon their well to wheel CO_2 emissions per unit energy. This would simultaneously create a market to attract investment by manufacturers in such fuels and matching vehicle combustion systems, as well as stimulating the highly desirable competition among different fuel design and combustion design alternatives.

V. The Renewable Transport Fuels Obligation (RTFO) represents a welcome step in increasing bio-fuel availability and awareness in the United Kingdom. The logical course for the new RTFO approach is to introduce fiscal policy measures to stimulate consumer demand for bio-fuels, and signal its escalating role over a period of time to stimulate the increase in the use of bio-fuels—a move which would have a significant impact on CO_2 emissions.

VI. E85, in this context, is an attractive option for which Ford makes the vehicle technology available. Policy and incentive frameworks need to encourage early adopters of bio-fuels such as E85 but also be alive to the need to avoid exclusive emphasis on prescriptive forms of bio-fuel, and encourage alternatives to compete on equal, CO_2 performance based terms with the blended ethanol technology. A balance needs to be struck between providing a stable fiscal and incentive environment for bio-fuel development and the encouragement of more productive emerging options. This will represent an emerging task for policy makers and other stakeholders in the transport sector.

Chart 2—CO_2 Pathways



VII. With regards to the proportion of the UK's transport fuel needs which could be met by bio-fuels we understand that this very much depends on where the boundaries are drawn. UK surplus wheat can contribute 5% of gasoline/petrol. The 10% of UK arable farmland that is classed as set-aside could be made available for bio-fuels, potentially contributing another 5%.[2] Looking at the EU as a whole, the head of the German bio-energy association (Bundesverband Bioenergie) was quoted as saying that "in approximately 10 years, in an extended EU there could be approx 50 million hectares of land that would not be needed for food production and that theoretically could be used for bio-mass / bio-energy production. This would have the potential to cover up to 40% of the EU's overall fuel needs." [3]

Q2. *How cost-effective are biomass and bio-fuels in comparison with other sources of renewable energy?*

I. Bio-fuels will become increasingly cost-effective with rising oil prices, but they need an appropriate incentive structure to get them started.

II. Ford recognizes the role that incentives can play in promoting low-carbon fuel technologies. However, any such incentive structure must be based upon performance, must be consistently applied across EU Member States and should not hinder future fuel technology developments.

III. For transport fuels, and excluding electric vehicles, realistically there are no immediate alternative renewable energy choices. Bio-gas is theoretically possible but carries a far greater infrastructure challenge than bio-ethanol or bio-diesel.

IV. Fuel cells are a longer term prospect but technical feasibility issues need to be overcome, costs significantly reduced and the hydrogen must be generated through renewable sources.

V. However, electric power may still have an important role to play in personal mobility in conjunction with Hybrid Electric Vehicle technology, provided that the electric power generation uses of one of the emerging low carbon technologies.

VI. From the consumer's perspective the FFV technology on-cost is very modest compared to other low-carbon technologies. This is an essential consideration in ensuring rapid adoption.

Q3. *How do bio-fuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?*

I. First generation UK-sourced bio-fuels (bio-ethanol from starch/sugars and RME/bio-diesel) produced in a modern facility, with appropriate use of bio-products, can reduce CO_2 on a Well-to-Wheels (life cycle basis) by 30–50%.

II. Second generation bio-fuels from wood and wastes improve this further to 80% and 90% for bio-ethanol and bio-diesel respectively. We believe that there is a significant potential for second generation bio-fuels (wood/ligno-cellulosic) which promise to achieve "well-to-wheel" CO_2 emissions close to those of even the most optimistic hydrogen fuelled propulsion systems.

III. We further believe that fuels which are compatible with the existing car parc and fuel distribution infrastructure will ultimately offer even more potential than those which are incompatible, such as E85, but recognize that these fuels are not yet available.

Q4. *Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?*

I. Ford Motor Company fully supports the need to produce bio-fuels in a sustainable manner and acknowledges, for example, the concerns over the use of palm oil.

II. First generation bio-fuel crops are derived predominantly from food type crops. As a consequence they tend to be protein rich; this is a waste of input for the bio-fuels industry.

III. The way forward to avoid these negative effects is therefore to incentivise bio fuels on the basis of CO_2 perfomance, which will accelerate the introduction of newer biomass sources and conversion processes which are capable of utilizing cellulosic sources and wood waste.

Q5. *What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and bio-fuels?*

I. We welcome the availability of grants for low-carbon infrastructure through the Energy Savings Trust. It is important that this continues, but we would suggest that alignment between the Treasury's three-year window and the Energy Savings Trust's five-year window would create greater stability and planning confidence.

II. Government should encourage the sustainable production of bio-fuels. Concerns currently exist over the production of palm oil and domestic production will help to minimize CO_2 from transportation in addition to issues of deforestation.

III. In the medium term the diversification of farming into bio-fuels could contribute positively to the UK farming sector and has the potential to contribute to a reduction in surplus food production. This assumes that customers are either obliged to buy blended products or act voluntarily through appropriate bio-fuels pricing mechanisms. Recent speeches of EU Commissioner for Energy Andris Piebalgs, and the agenda of the Austrian Presidency to set out a bio-fuels framework adds further stimulus to the market.

IV. Ford also seeks recognition that Well-to-Wheels is an appropriate yardstick for measuring CO_2 as current UK Government taxation policies are focused exclusively on tailpipe (eg Company Car Tax, Vehicle Excise Duty).

Q6. *What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?*

I. Ford recognises the role that incentives can play in promoting low-carbon fuel technologies. However, any such incentive structure must be based upon performance, must be consistently applied and should not hinder future fuel technology developments. Consistent with this approach is the scope for stimulating new markets for renewable fuels.

II. We welcome the availability of grants for low-carbon infrastructure through the Energy Savings Trust. It is important that this continues, but we would suggest that the current misalignment between the Treasury's three-year window and the Energy Savings Trust's five-year window is a barrier to further investment.

III. We would also seek recognition that Well-to-Wheels is an appropriate yardstick for measuring CO_2 as current UK Government taxation policies are focused exclusively on tailpipe (eg Company Car Tax, Vehicle Excise Duty).

IV. We reiterate the need to base any incentives structure upon performance, to apply with consistency and not to hinder future fuel technology developments.

Q10. *What lessons can be learned from other countries' experience in the production and use of bio-energy?*

I. The principal lessons are that there are initially significant institutional barriers and general inertia to be overcome when moving down the path of bio-energy.

II. The support comes from niche oil companies who are able to adopt early.

III. The bio-energy market needs to be financially supported until it can reach a scale where it can begin to compete head-to-head with non-renewable technologies as the market does not fully reflect the cost of utilising non-renewable resources.

IV. The barriers to widespread use of bio fuels reside primarily in the incompatibility of blended ethanol fuels with the existing car parc and the fuel distribution infrastructure. This can be overcome with the development of "backwards compatible" bio fuels.

V. The market mechanism must be stimulated to engage consumers in the choice sthey can make around CO_2 consequences and there will have to be a period when fiscal incentives based on CO_2 emissions performace outcomes are deployed to stimulate and accelerate demand for such fuels. Supply follows demand, not the reverse.

Summary

21. Ford is committed to addressing the challenge presented by climate change and supports the conclusion of the CARS21 report that an Integrated Approach would deliver greater and more cost-effective CO_2 reductions benefit than improvements in vehicle technology alone.

22. Just as vehicle technologies are evolving, so too are fuel technologies. The key measure of performance for fuel technology should be grams of CO_2 emitted per kiloJoule of energy released. Within that context, bio-fuels have an important contribution to make in reducing CO_2 emissions and in reducing the UK's dependency on imported energy.

23. Second generation bio-fuels, in particular, promise to achieve "Well-to-Wheel" CO_2 emissions close to the hydrogen fuel cell.

24. Policy and incentive frameworks need to encourage early adopters of bio-fuels such as E85 but also be alive to the need to avoid exclusive emphasis on prescriptive forms of bio-fuel, and encourage alternatives to compete on equal, CO_2 performance based terms with the blended ethanol technology. A balance needs to be struck between providing a stable fiscal and incentive environment for bio-fuel development and the encouragement of more productive emerging options. This will represent an emerging task for policy makers and other stakeholders in the transport sector.

25. Bio fuels that are compatible with the existing car parc and fuel distribution infrastructure are more attractive than those which are not.

26. Ford has significant experience as the leading supplier of alternative fuel vehicles globally and has led FFV sales in Europe since 2001.

27. Ford recognizes the role that incentives can play in promoting low-carbon fuel technologies. However, any such incentive structure must be based upon performance, must be consistently applied and should not hinder future fuel technology developments.

References

1. EUCAR/Concawe/Commission JRC Report "Well-to-Wheels Analysis of Future Automotive Fuels and Powertrains in the European Context", December 2005.

2. Defra "Renewable Bio-Fuels for Transport", 2003.

3. VDI Nachrichten, 24 June 2005.

Ford Motor Company

February 2006

Memorandum submitted by Rolls-Royce (Bio 29)

ALTERNATIVE AVIATION FUELS

1. Thank you for seeking our views on alternative fuels for aviation in the context of using biomass as a route to renewable energy.

2. Rolls-Royce is committed to reducing the environmental impact and increasing the sustainability of our products. We are therefore determined to explore all potential methods to achieve this aim. We understand that the use of fuel derived from biomass offers the potential of a sustainable supply of energy with zero net carbon emissions. However, we believe that it is more logical to use available fuels of this kind for ground-based transportation and energy uses.

3. Aviation fuel has a unique set of requirements, which the current fuel, kerosene, meets safely, reliably and efficiently. These include a high energy density in a low volume and a high flash point coupled with a very low freezing point. It is also readily available in a consistent form throughout the world.

4. We supported and actively participated in the PRESAV (Potential for Renewable Energy Sources for Aviation) study carried out by Imperial College in 2003 for the Department of Trade and Industry. This study evaluated the feasibility of a wide range of alternative fuels such as hydrogen, synthetic kerosene, bio-diesel, and bio-alcohols.

5. We are also in regular discussions with the world's major aircraft manufacturers and aviation fuel suppliers with whom we share ideas and knowledge in the search for innovative solutions.

6. There is a need to consider in a balanced way all the environmental impacts of aviation including carbon dioxide, air quality and noise. While carbon dioxide emissions from aircraft are a significant and growing contributor to climate change, aviation emissions at cruise have additional effects due to the altitude of the emissions. These include the indirect impacts of NOx emissions and the formation of contrails and possibly aviation related cirrus clouds. The current scientific understanding of these phenomena is far from mature and it is unclear whether the impact of alternative fuelled aircraft, either hydrogen or bio derived fuels, would be any better (or worse) than kerosene fuelled aircraft.

7. Bio-fuels have a lower energy density than kerosene and would therefore increase the take-off weight of aircraft, lowering the overall efficiency and requiring more thrust to be used at take-off, with a resultant direct increase in noise.

8. Bio-diesel, or Fatty Acid Methyl Esters (FAME) can be used in small quantities as kerosene extenders, up to a maximum of around 10–15%. However, above this proportion there will be problems as the fuel becomes solid in the low temperatures experienced by aircraft.

9. For land-based uses, it is clear that most of the climate impact that relates to the combustion of fossil fuels can be removed or offset. However, the PRESAV study highlighted concerns for local air quality from the use of some alternative fuels. For example, there is a concern that formaldehyde and acetaldehyde emissions, known to have an impact on human health, would result from the use of bio-fuels such as bio ethanol. A wide range of additional issues would need to be considered before wider use of bio-fuels could be encouraged. For instance life cycle impacts, including those from the manufacture, refinement and transportation of the fuel, must be understood and quantified in order to identify which alternative fuels offer net benefits over traditional fuels.

10. Synthetic kerosene, such as that manufactured using the Fischer-Tropsch process by SASOL in South Africa, has been evaluated and approved for use by Rolls-Royce in our aero engines at a 50% mix with standard kerosene. This process currently uses coal as the raw material, but could use any hydrocarbon, such as biomass. The use of this fuel will become increasingly attractive if the price of oil remains at a high level.

11. We are active participants and signatories to the commitments contained in the UK's Sustainable Aviation initiative and our major contribution to addressing the environmental impacts of aviation will be our investments in technological research and new product development which will deliver further reductions of noise, emissions and fuel burn. Aviation kerosene accounts for only 3% of the global use of fossil fuels. It can be argued that the benefits to local and global economies and to personal and social mobility brought about by aviation justify the use of this resource for this purpose in preference to other uses for which alternative energy sources are more feasible.

12. To conclude, while there is some technical possibility of using alternative fuels for aviation, there is currently little or no apparent benefit from doing so. Using alternative fuels for ground based energy use and land transportation is far more practical in the-short term and will deliver more environmental benefits than if the fuel was used for aviation.

13. If you or your team would like to discuss these issues in more detail with my technical group, you might like to contact Colin Beesley who is our Head of Environmental strategy.

Chief Executive
Rolls-Royce

March 2006

Witnesses: **Mr Joe Greenwell**, Vice-President of Government Affairs, Ford of Europe and Premier Automotive Group; **Dr John Bennett**, Fuels Technical Specialist, Ford of Europe, and **Mr Andy Taylor**, Director of Corporate Citizenship, Ford Europe; **Mr David Clarke**, Head of Technology Strategy, **Mr Colin Beesley**, Head of Environmental Strategy and **Mr John Moran**, Chief of Combustion Research, Rolls-Royce plc, gave evidence.

Q343 Chairman: I would like to start off with a question for our automotive colleagues. In your evidence you said on page 2 which caught my eye: "The fuel industry and the automotive sector must further increase the market penetration of alternative fuels through a substantially increased offer in accordance with the EU Biofuels Directive, easier availability and enabling vehicle technology".[1] Is there any sign that that aspiration is being turned into reality?
Mr Greenwell: Perhaps I can comment on that first. I think as you have heard from other evidence there are issues around awareness and around fuel distribution and around incentivisation, and we see some contrasts around those matters even within Europe. The price at the pump, the difference between petrol and biofuel, bioethanol, is quite modest. Bioethanol is about 2% lower at the moment. Elsewhere in Europe where a more comprehensive incentive package has been put together you see differences of 30% and more, supported by a number of other incentives to the consumer like reduced purchase tax, reduced annual circulation tax, car park waivers, congestion charge waivers, plus some allied encouragement to petrol retailers, garages, to have a pump addressing the distribution issue. The result of that is that in Sweden you are making a market, and of our 26,000 Focuses that we have sold recently 21,000 are Focus FFVs. So to your general point there are signs within Europe—and not just in Sweden but Germany, and others have referred to the removal of the fuel duty—where a market is being made. You will know from our written submission, we think increased consumer awareness, encouragement to the consumer to consider biofuels, and frankly some straightforward incentives to the process, can yield some results.

Q344 Patrick Hall: On page 1 of Ford Motor Company's evidence, sixth paragraph, and I want to clear this up first because this is a rather important first principle, there is a reference to: "At Ford Motor Company we have long acknowledged the importance of climate change." Does that mean climate change triggered by human activity, because in the US there has been and still is considerable questioning as to whether or not it is triggered by human activity. What is the company's position?
Mr Greenwell: I think our position with the publication of our climate change document last year is clear—that we think that the science is compelling. We appreciate that there is an active debate going on but we think for our part we need to gear our activities towards product development and offerings around biofuel that can offer some improvement to cover current levels of CO_2 emissions. So we are clear in that. We believe that the science is persuasive and that our product plans, which we suggest in the written submission, are a response to that information.

Q345 Patrick Hall: So science and the majority of scientific opinion throughout the world is the opinion that Ford goes along with, even though that has been challenged?
Mr Greenwell: We know that the debate is live, and continues, but for us we are totally—

Q346 Patrick Hall: I do not think the debate continues in many places except in the United States, and it may be reducing there. Can I look at the reference in the evidence—I think it is page 3, and you just mentioned it yourself, Mr Greenwell—to Sweden and the Focus Flexi-Fuel Vehicle. It says there that the E85 fuel is less efficient therefore there is a higher fuel consumption, so why go for it? What is the effect on CO_2 savings if you have to consume or burn more of the fuel to do the same journey?
Mr Greenwell: To answer your question specifically let me hand over to Andy Taylor, who has been closely involved in that initiative in Somerset and also in Sweden.
Mr Taylor: You may be misinterpreting that slightly. When people in Shell talk about, as we were previously discussing, CO_2 reductions as being 50%, maybe 85%, the additional use of ethanol is already factored into those calculations, so 30% more fuel is required but you still recognise and still end up with the 50%, maybe 85% reduction in CO_2, even with the higher ethanol usage.

Q347 Patrick Hall: So on those grounds there is no doubt at all that in terms of reducing CO_2 emissions it is worth going for, and you are going for it in Sweden. The next question is, in terms of cost to the customer, is the regime in Sweden more favourable than in this country?
Mr Taylor: Yes, very substantially. In Sweden typically a customer would see a 30–35% reduction in fuel price for an E85 per litre relative to the unleaded gasoline.

Q348 Patrick Hall: But they would need to use more?
Mr Taylor: Yes, but it is pretty much cost neutral, from a customer's perspective. You would have to use 30% more but it is 30% less per litre, in orders of magnitude. As my colleague was explaining there are other incentives in Sweden to encourage the usage of environmentally friendly products, of which the Flexi-Fuel Focus is one. So the company car tax is lower, there is free parking, the congestion

[1] Ev 134, para 10

charge—which is only a new thing in Stockholm, flexible fuel vehicles like hybrids and gas vehicles are exempt from the congestion charge, so there are other mechanisms in place to encourage the purchase of flexible fuel vehicles and to encourage the purchase of bioethanol. In contrast, in the United Kingdom we do not have those incentives at all to encourage such usage. The price in Somerset is roughly 2% lower, and the price in Norfolk, which is where higher blend bioethanol is sold, is 2p per litre cheaper on the forecourt, and there are ten filling stations operating.

Q349 Patrick Hall: However, in terms of fuel consumption, et cetera, it costs you more?
Mr Taylor: Absolutely.

Q350 Patrick Hall: So why is the Somerset initiative off the ground and why are you supporting it?

Mr Taylor: When we started the Swedish project the situation was very similar. You had a situation where people wanted to demonstrate a clear commitment to the environment, so we were nurturing the Somerset project in much the same way as we were nurturing the Swedish project. Now, reality will bite at some point when some people say: "Can we take this beyond a pilot?" It was very much a pilot, proving it could be done, proving there is an awareness of an interest, so it is a pioneering effort, and that is what we are trying to support.

Q351 Patrick Hall: Are you subsidising the Somerset initiative?
Mr Taylor: Are we subsidising it?

Q352 Patrick Hall: Yes. You may be investing in it but you may also be subsidising in order hopefully to get past this threshold that has happened in Sweden.
Mr Taylor: We are nurturing it, so if you class that as subsidisation as we are putting a lot of effort in and our time, yes. In terms of throwing cash at it then, no, we are not throwing cash at it.
Mr Greenwell: We are supplying.
Mr Taylor: Vehicles will be supplied at a very competitive price to encourage development.

Q353 Patrick Hall: Based on your experience in Scandinavia and in Somerset, or that part of England, are you making the case perhaps behind the scenes with the British Government to bring about the integrated approach that you say works well in Sweden?
Mr Greenwell: We are certainly fans of the integrated approach, as must be very clear, but as you will have seen from the written submission we think that biofuels can make a tremendous contribution to climate change work but there are also some significant developments on the product front, so we wanted to present in our written submission an array, a portfolio, of product actions devoted to CO_2 reduction over time within which we see biofuels as playing a significant role in generation 1, and we would support the view expressed earlier that, depending on the original manufacturing conditions, generation 1 can yield very substantial reductions in well-to-wheel CO_2, well in excess of a typical 50%—up to 70% I think we have said in the past. But the further attraction involves the Generation 2 biofuel developments which provide typically 80–85% reduction well-to-wheel. Andy made clear that to some degree our technologies, our product development engineers, are pathfinding here along a number of fronts, and those fronts are with conventional petrol power train, diesel power train, where direct injection and clean diesel can give tremendous yield in terms of CO_2 reductions. In fact, we would argue—and have—that it is quite wrong to favour a particular technology because depending on use a clean diesel in a Fiesta or a Fusion gives 112–114 grams per km which is a very creditable level, but we are looking at hybrids as well. So we look at conventional, hybrids, weight-saving, and hydrogen internal combustion further down the track and fuel cells as well. With our own biofuels we have presented a significant element and one which our engineers feel holds good promise for the next generation of technology, but with any new technology you have to do some groundwork and you have to try and encourage the making of a market. Our experience to date is that it is important to raise awareness amongst consumers and give them a reason to pursue.

Q354 Patrick Hall: The Focus vehicle is trying to change the market, change public perception.
Mr Greenwell: I think it has already, as you can see, in a market in Sweden selling in numbers, in certain market conditions. Those market conditions do not apply at the current incentive levels in the United Kingdom, but we are keen to promote those vehicles in the Somerset project, and to other local authorities, in terms of the well-to-wheel CO_2 emissions reductions, as part of this portfolio.

Q355 Patrick Hall: So is the Ford Motor Company no longer going to promote big tank four wheeler gas guzzlers with bull bars and that sort of image?
Mr Greenwell: Well, we do have a variety of brands! Jaguar, for example—and you will not find bull bars on Jaguars but Jaguar has significantly decreased its CO_2 emissions with the advent of the X-type diesels. The new XJ diesel is a tremendous product, and a tremendous advance. Land Rover, too, has reduced its CO_2 emissions and we are mindful of the need to carry on doing more. It is difficult for us here to lay out our product plans but over time I think that the public will see the seriousness of our intent across the brands.

Q356 Mr Drew: The Select Committee, I think you will all be aware, did make a visit to Brazil and we saw the bioethanol vehicles there. I think what struck us was the willingness of the Brazilian government just to impose its solution on the car companies. Would you welcome imposition?
Mr Greenwell: No. I think what we favour is technology neutrality. There are developments all the time: witness the prospect of second generation biofuels. We think that a balance needs to be struck between incentivising the here-and-now technology to deliver real benefits, in terms of reduced well-to-wheel CO_2 levels, but not to have it at a level that will discourage further developments in potentially more productive iterations of that technology. So we do not think there is a silver bullet—

Q357 Mr Drew: But the Brazilians, as a result of quite a brave decision where everyone said they would end up with no car manufacturers, are now a leading manufacturer in the world, a leading exponent of biofuels, and we have got nothing.
Mr Greenwell: We think that our proper course is not to favour a particular technology or have the regulators favour a particular technology. What we favour is a technological neutrality, operating on a number of fronts so that we can ensure there are developments which ultimately may prove more beneficial than the chosen singular route, and I have described the product approach we are taking, and that includes hybrids and, of course, it includes hydrogen-powered vehicles as well.

Q358 David Lepper: Can I just come back for a moment to the Somerset project? You have some local partners involved, and you are nurturing that project there. What level of interest has there been from other local authorities or institutional bodies with fleets of vehicles?
Mr Taylor: I personally have been involved in presentations to Cornwall, South Wales, we are due to go to Norfolk and we are aware of a number of others. I was in Fylde a week or so ago, so we are aware of a substantial interest. Now, can we turn interest into practical implementation? We are not so sure but we bring a portfolio of partners; we bring people who will provide the fuel, who will provide the distribution, so we are not just doing this as a car project. We are working with partners to make this work at a local level as a practical solution.

Q359 David Lepper: And they are mainly local authorities?
Mr Taylor: It is certainly true that for the most part it is local authorities who represent the driving force. However, there are some commercial fleet companies who wish for reasons, reputational aspects to be involved with this, so they may be willing to take an on-cost. I cannot speak on whether they have a specific motivation but one anticipates they are prepared to take an on-cost in order to build a reputation and be seen to make a contribution to the community.

Q360 David Lepper: Do you have a time limit on Ford's involvement?
Mr Taylor: We see biofuels as part of a solution to the tackling of climate change.

Q361 David Lepper: I understand that. I meant specifically in Somerset.
Mr Taylor: The commitment to Somerset is for three years.
Chairman: I should just put on the record that I was very appreciative of Ford supporting the launch in my constituency of an initiative which has the long-term objective of turning the Borough of Fylde into the most energy efficient borough in the country. They very kindly came along and stimulated interest in it by bringing one of the flexi-fuel vehicles to be at the launch. I was very grateful and I would like to publicly acknowledge that kindness in supporting the start of what I hope will be an interesting experiment. Can I just say to Rolls-Royce that this is a bit like waiting for the plane, there is quite a long procedure before we get to the bit on aviation but we will get there.

Q362 Mr Rogerson: Having talked about flexi-fuel vehicles, can we move on to hybrids. I understand that you have a vehicle which has been on sale for a couple of years in the United States.
Mr Greenwell: Yes.

Q363 Mr Rogerson: And you have committed to having "available for sale globally up to 250,000 hybrids a year by 2010".[2] What proportion of your total annual sales do you anticipate making from hybrid vehicles up to and after 2010? How do they compare with conventionally fuelled vehicles in terms of price and also running costs?
Mr Greenwell: I do not have the exact figure but it is going to be small, 250,000. We are still likely to be producing those conventional power trains in petrol and also diesel, but it is going to be a growing number. Because of the diesel characteristics of the European market we see particular potential for diesel hybrids as part of our overall efforts to reduce CO_2 emissions. Part of the constraint has been touched upon already in that hybrid in current technology remains expensive, so we need to continue to work hard on that technology in order to try and develop the market with the consumer. We are going to be producing hybrids across our brands as we go forward. I do not know whether my colleagues would want to add to that?
Mr Taylor: The marginal cost of CO_2 reduction in hybrids is a tough sell for Europe and it remains to be seen whether hybrids will be a huge growth area in Europe. Certainly in terms of comparing to biofuels the cost of the technology to car companies much, much favours biofuels versus hybrids.

[2] Ev 134, para 8

Q364 Mr Rogerson: Can you give us an indication of the cost to the consumer of a hybrid car?
Mr Greenwell: It depends on whether it is a micro or a full hybrid. With a full hybrid you are into thousands of dollars. I think my colleague mentioned, or it is in the written submission, that the on-cost for a flexi-fuel vehicle is £200. It is hundreds of dollars at the smallest level of hybrid for a belt-ISG but for a full hybrid it is a significant on-cost. In order to make a market and business case for these developments you have to iterate the technology and continue to work on it consistent with the other objectives that we have described. I do think diesel hybrids offer that, and we are looking with particular interest at Europe because of the diesel market characteristics there.

Q365 Mr Rogerson: We did see when we were in California, or we heard about the possibility of plug-in hybrids. Is that something you are considering?
Mr Taylor: This is where you recharge your battery overnight effectively. Ford Motor Company has some experience of battery technology. We had a Think division for electric vehicles which we have sold in the UK. There are lots of issues to be overcome with plug-in battery technology. It is something we are monitoring and looking at but there are huge barriers to be overcome in terms of durability of a motor vehicle. Shell mentioned twelve to 15 years but having a battery being recharged continually for 12–15 years represents some technical challenges; no battery I am aware of today can achieve that.

Q366 Mr Rogerson: Would you care to hazard a guess as to how far away that technology is?
Mr Taylor: No, I would not care to hazard a guess. It is something that we are monitoring very carefully.

Q367 Mr Rogerson: Do you think that such technology would have a part to play in carbon saving?
Mr Taylor: We are not in a position, as Ford Motor Company, to say what the solution here is to this very serious issue. We would not rule it out. Can I tell you it is going to be at the forefront? No, I cannot tell you that. What probably will happen is you will have a combination of plug-in hybrid and biofuels together in combination and the hybrid using a biofuel product could be a substantial way forward. That represents a new level of complexity—electric, biofuels and hybrid—which is a substantial challenge for us and substantial investment cost.

Q368 Lynne Jones: You say in your submission that climate change is a critical business issue for your company. Why?
Mr Taylor: There are a number of different levels for that. One is cost of ownership of vehicles will change materially as legislators look to tax fuels differently, tax vehicles differently so it will restructure our business and change our business. We have to anticipate this and respond appropriately to the marketplace, to anticipate the future marketplace.

Q369 Lynne Jones: You are requiring mechanisms to make the market for your vehicles in order for you to invest. You are not investing out of the goodness of your heart because you are concerned about climate change; it is necessary for governments to impose upon you conditions that will require you to make those investments.
Mr Greenwell: I do not think that is an entirely fair construction of Ford Motor Company's motivation. I think the German company has been pretty consistent in its expressions of—

Q370 Lynne Jones: Are you involved with the motor companies that are prosecuting the Californian organisation that controls vehicle emissions?
Mr Taylor: I understand all the car companies are trying to prevent that.

Q371 Lynne Jones: You are not really concerned. You are only really concerned about ensuring that you have a market for the future.
Mr Greenwell: I think that is an issue of state management and policy versus federal management and policy and what is the right way to go forward.

Q372 Lynne Jones: Okay. You heard the discussion with Darran Messem about second generation fuels, would you like to comment on that? Does it concern you whether or not the biofuels that are going in to fuel your vehicles are produced sustainably or with low CO_2 emissions?
Mr Greenwell: Absolutely, it does concern us, and we are very clear about that in our climate change reports and here and now. It is something that we are acutely conscious of. We are interested in sustainable sources and processes.

Q373 Lynne Jones: So what do you think our Government, or governments in Europe and across the world, should be doing to ensure that we move forward in a way that maximises the CO_2 benefits of new technologies?
Mr Greenwell: I think we have laid out an array of technologies which we are engaged in, that we have been engaged in and we are engaged in. We are enthusiasts of biofuel, genuine enthusiasts of biofuel. I would like to think that what we have done since 2001 in Sweden, which was basically lead the industry in Europe, if we can be immodest for a second, followed up by the encouragement we are trying to offer in the UK markets through what my colleague has described, is evidence that we think biofuel, alongside some of those other product technologies, has a real yield. We think second generation, notwithstanding what you have just said about sources and sustainability, offers us some further significant gains.

Q374 Lynne Jones: How do we ensure that we get those gains because in the UK there is no real pressure to ensure that the biofuels that are receiving the Obligation Certificates are going to be environmentally sustainable or particularly good on the CO_2 emission front?

Mr Greenwell: I think putting forward the facts about technologies and their CO_2 performance well-to-wheel through the auspices of the Committee and projects such as our own is a way of raising awareness, not just amongst the consumer but other commentators about the relative benefits from various of these technologies. Acting in concert, we think carmakers can make a very significant impact and we think second generation biofuel has real potential.

Q375 Lynne Jones: If they are buying one of your flexi-fuel vehicles or putting biofuels in their tank up to 5%, are people not going to be thinking they are doing something good for the environment when, in fact, perhaps they are not, relatively speaking? The biodiesel is being sourced from perhaps non-sustainable palm oil or the bioethanol from far away in sugar plantations that are knocking down the rainforests. What are you doing to actually get the message across and to promote the use of really sustainable biofuels and ensure the investment in the second generation technology?
Mr Greenwell: I think the process needs to be exposed to scrutiny. That is the way that some of the challenges that were outlined earlier will come to the fore and they must be challenged, as you did us, on what their attitude towards sustainability is. All we can do is not just pay lip service to our interest but back it up producing demonstrators, products which we offer to consumers in the marketplace, suggest that further incentivisation may be a route, warn against a silver bullet approach and we should be technologically neutral. A balance needs to be struck between incentives with the technology that is here and now to get that well-to-wheel CO_2 reduction in place but not to discourage further developments within the technology that offer protection.

Q376 Lynne Jones: Would it bother you if the Government imposed a carbon assurance scheme which meant that a lot of the biofuel that is currently on the market would not qualify because it would not meet the high standards of an assurance scheme?
Mr Greenwell: If you are talking about standardisation, we think it is very important that fuel quality standards are met in order that—Our cars can run at 5% now for the RTFO, some can run at 10%, but we need to do some work to ensure that they can all run at the 10% blend level. Frankly, we need standardisation to establish those standards in order that we can meet that further enhanced objective.

Q377 Sir Peter Soulsby: In Shell's evidence and in questioning Mr Messem we were discussing the role of hydrogen and he implied—I hope I am not putting words into his mouth—that attractive as it might be it was a somewhat distant prospect. I was aware, I think it was in the *Observer,* Keith Lewis of the SMMT said that cars powered by hydrogen cells were the "ultimate aim". From what Mr Messem was saying earlier on, ultimate may be quite a long way away. Is that your expectation of the prospects for hydrogen?
Mr Greenwell: It is not an unusual observation. If you look at the chart of well-to-wheel it is probably the optimum power unit. That said, you did have a discussion about some of the technical and commercial feasibility issues associated with hydrogen, and they are real and typically people talk of 15–20 years away. We have demonstrators now. We have hydrogen powered vehicles now. The issue is well-to-wheel—I will not repeat the point the witness made about the influence of the production of the manufacturing source—but there is also storage and the infrastructure associated with it. We are talking about the availability of E85 pumps.

Q378 Sir Peter Soulsby: Some Members of the Committee did have an opportunity to tour the Sacramento Fuel Cell Partnership where we saw some of the prototype vehicles. I note after he visited it, President Bush said: "Hydrogen is the fuel of the future, not a foolish dream". You might agree with that but it does sound, if not a foolish dream, a very long-term prospect rather than a medium one.
Mr Greenwell: Some of the technical challenges are clearly very substantial and they are well-known. I can only speak for our company. We are engaged in HICE[3] and we are engaged in fuel cell work too. Many other car companies are involved in seeing the potential prize but infrastructure challenges, technical challenges like storage, and those mentioned earlier about the nature of the manufacturing source and the implications of that for well-to-wheel, all of those are to be wrestled with. Frankly, there is no short-term prospect of that technology superseding any of the others that you have mentioned.

Q379 Sir Peter Soulsby: When we were in California we did see what the state government was doing to support the prospect of the use of hydrogen. Is there anything that our Government could be doing to make it an earlier prospect in the UK?
Mr Greenwell: I think it is difficult. The technical problems are the technical problems and the infrastructure challenges are there for all of us. I think continued liaison with trade groups like SMMT and individual companies around these challenges is very important but I do not think that should deflect us from taking advantage of technologies that are manageable, that we can get our arms around and offer benefits in terms of well-to-wheel CO_2 reductions right now. Frankly, we are doing both in parallel and everyone is being candid about the timeline associated with hydrogen, and it is further out.

Q380 David Lepper: Colleagues from Rolls-Royce, welcome. I hope you found the first part interesting. I think everybody is agreed about the importance of dealing with aviation fuel in terms of our CO_2

[3] Hydrogen internal combustion engine

emissions and the world's CO_2 emissions. I think the Tyndall Centre for Climate Change Research recently said that if the climate change impact of aviation continues to grow at current rates, all householders, motorists and businesses would have to reduce their CO_2 emissions to zero in order for the UK Government to meet its 2050 target. I would be interested in hearing what Rolls-Royce is doing within that context. Can I just put something to you that you said in your submission, and that was to express a concern about alternative fuels for aviation due to "safety, energy density, cost, global availability and environmental impact". You have got some concerns about alternative aviation fuels. Some of my colleagues who went to the US heard similar concerns being expressed by Boeing in Washington. What is Rolls-Royce up to and what is the issue about the problems with alternative fuels?

Mr Clarke: I will comment to start with on what we are doing generally and then I will pass to Colin and John to comment on the details of the technical programmes and the issues around alternative fuels where there are some very big concerns both from our side and the operators' side. If you look generally at what we are doing in this arena, we invest about £600 million a year in product development, at any one time we are probably developing between two and five new gas turbine products for aviation and every single one of those represents an improvement on the one that went before. This year we are doing two major new engines which will be improvements over what we did just last year. To give an indication of what that means in practice, over the last 50 years, which realistically is the horizon of the gas turbine jet industry and aviation industry, we have improved fuel efficiency of our engines by about 1% a year, which may not sound very much but the reality is when you are working with something where simply achieving that kind of change requires that kind of investment every year, that is a fair rate of progress given we are dealing with materials and structures operating quite literally at the limits of their capabilities. This is not something you can change trivially in terms of changing fuels. John, who is chief combustion engineer, will explain some of the realities of what is involved in changing the fuel of an engine. Given that kind of background, the fuel we are using has not changed particularly for many years in the industry. Where we are going right now is we are evaluating the possibilities of alternative fuels and we do that mostly at a research level where we are working with a number of UK universities and overseas in terms of what is possible given the types of engine and type of combustion systems that we have got today, and we are looking at where will be the bounds in terms of alternative fuels. One of the key things to bear in mind is this is an industry where we cannot change anything independently of the fuel manufacturers or independently of the operators, independently of other international agencies and international programmes, so we work very closely with all of those groups and are represented on groups like ICAO[4] which is looking at emission standards from engines and fuel standards to go with aircraft. We are working with all of those groups in a genuinely co-ordinated fashion to take these kinds of issues forward. I must stress it is not something that is immediate, and the Ford guys said the same thing about their products, you are talking about a 12–15 year life cycle. Shell was saying ethanol is a 50 year programme. Our products are out there 25 years-plus, we design for a minimum 25 year operation. To change that product significantly, those gas turbines that fly overhead here and right now, you will have to engineer a new engine and in crude terms you cannot retrofit. You cannot go to a Boeing 747 and put a completely new engine on to it without huge investment. It does mean there is a very long-term life cycle. Realistically you cannot roll over product in a few years, it is going to be a 25 or 40 year programme to roll over gas turbine product into a new technological standard. You can do some of that but it is a hugely long-term business that we are in and a quite challenging one.

Mr Beesley: If I can start with the Tyndall Centre report, which we read with great interest. We would not argue with the results of the sums that they came out with given the assumptions they used, which were rather pessimistic from an aviation point of view and very optimistic from all the other sectors' points of view which relatively made the aviation sector by 2050 very large compared to everybody else's emissions.

Q381 David Lepper: The Government does seem to be looking towards a huge increase in air travel.

Mr Beesley: Yes. In some ways the increased focus on the environmental challenges of the aviation industry mean it is a victim of its success in meeting the growing demand for air travel and air transport that more and more of us want to do as much as we can. Rolls-Royce is a founder signatory and very proactive in the formation of the Sustainable Aviation Strategy, which was launched last year, which is a collaboration between the manufacturers, the airlines, the airports and air traffic control in the UK, and has set out a path towards sustainability. The major contribution from our perspective is the technology. As David was referring to, specifically we are committed to a 50% reduction in fuel burn and CO_2 emissions over a 20 year timeframe of 2000—20, on top of a 70% reduction in fuel burn that we have done historically since the first jet aircraft. We are talking about huge improvements in efficiency on top of what has already been achieved. We have not planned any contribution from lower carbon fuels in those assumptions, we are assuming that the current global standard fuel, Jet A1 kerosene, will remain so. As David referred to, aviation is a truly global industry, aircraft have to be able to rely on the same standard quality fuel being available at all of their destinations and also some

[4] International Civil Aviation Organisation

unintended destinations occasionally. Safety is the number one priority of the aviation industry and it has an excellent safety record.

Q382 David Lepper: I think you were involved in, or contributed to, the study carried out by Imperial College two or three years ago on Potential for Renewable Energy Sources for Aviation.
Mr Beesley: Yes.

Q383 David Lepper: It sounds as though perhaps you do not agree with some of the findings of that study which suggested that synthetic kerosene and biodiesel offered, I think they said, the greatest potential benefits as alternative aviation fuel.
Mr Beesley: It would be fair to say we nurtured that report, using the terminology of the day.

Q384 David Lepper: There is lots of nurturing going on.
Mr Beesley: The Department of Trade and Industry funded the work with very strong guidance from ourselves and British Airways, who ought to be credited also. We gave them the brief of going away and finding the best alternative aviation fuel, so the report is written in that context. They talked about three possibilities and dismissed lots of other alternatives. I think the most practical solution was the Fisher-Tropsch synthetic kerosene which is currently being used and approved for use at a 50% blend. It is manufactured by Sasol in South Africa. Much of the fuel that is uplifted in Johannesburg is already synthetic kerosene. In this case it is manufactured by coal but there is no technical reason why the same process could not be used to manufacture it from biomass. In terms of the report it is a proven practical alternative. The other fuel that they said was possible was hydrogen, which is a very long-term potential for the future. Most people who have looked at hydrogen have said there are some huge, great technical challenges mainly to do with the storage of the fuel and the logistics of creating enough hydrogen at all the airports of the world. Many people say that you would expect aviation to move over to hydrogen ten to 15 years after all other transport has. I think in the context of the discussions you were having earlier you can see where we are coming from there. Within the PRESAV report we did suggest the possibility of blending biodiesel into traditional kerosene. With the benefit of hindsight I think they were a little optimistic. They say ten to 20% would be possible but we would have concerns certainly at the higher end of that range. One of the fundamental properties that an aviation fuel has is that it has to remain liquid at minus 60 degrees centigrade, which is the temperature within the wings at altitude. Not only that, you have to have a fuel where the engines can be relit at 30,000 feet, which is a big challenge. The biodiesel fuels have technical constraints which do not make those two things easier. Also, any fuel containing oxygen, as all the biofuels do—biodiesel and ethanol contain oxygen—is not good news for an aviation fuel. If you are carrying around heavy oxygen molecules you have to burn more fuel just to carry it around. There are some real inefficiencies just from using a fuel that has got less energy density.

Q385 David Lepper: Presumably you have given consideration to the implications of eventual agreement, if it happens, on aviation being included within the EU Emissions Trading Scheme. There are discussions going on towards that end, which may or may not be completed at some point. I imagine you and others have taken into account the likely implications of that. Is that likely to affect the speed of technological process or not?
Mr Beesley: I have to admit to an interest. I have been a member of the Aviation Working Party—

Q386 David Lepper: Good.
Mr Beesley:—on the European Commission Climate Change Programme looking at incorporating aviation into phase two of the Emissions Trading Scheme. There are a huge number of options available. The working party submitted its final report literally a few days ago which will be presented to the European Parliament during this year. There are many problems in integrating what is a European scheme within a global aviation industry, some of them political, as you can imagine. If it is just a European scheme, which would be the least controversial, it would be unlikely to have any great impetus on a global aviation industry. Intra-EU aviation is only about 15% of global aviation, so there would be little incentive for products being developed specifically for the European market. There is also the issue of the fact that aviation uniquely has impacts on the climate beyond just its CO_2 emissions. It is unclear with the current level of scientific understanding what the best way is of addressing that. We know that reducing fuel burn is a good idea and reducing CO_2 has got to be a good thing, so the whole aviation industry is geared towards reducing its fuel burn and increasing its efficiency. Emissions trading will hopefully further encourage that which is happening anyway.

Q387 Patrick Hall: I would like to congratulate Rolls-Royce on the evidence. I thought it was very readable as well as being short, and that always helps. I thought paragraph six was particularly measured and balanced where you say: "While carbon dioxide emissions from aircraft are a significant and growing contributor to climate change . . ."[5] et cetera, plus the effect Mr Beesley has just referred to of cruise, which I had not sufficiently understood. Can I say the message in paragraph six contrasts rather strongly in my view with the message in paragraph 11 where you said: "Aviation kerosene accounts for only 3% of the global use of fossil fuels. It can be argued that the benefits to local and global economies and to personal and social mobility brought about by aviation justify the use of this resource for this purpose . . ." et cetera. That

[5] Ev 140, para 6

sounds like on the one hand you are upfront about the issues and on the other you are not yet serious about doing something about it. That message in paragraph 11 could sound complacent, and you are here to explain this. I would like to ask you exactly where is Rolls-Royce's policy on this issue. As a supplementary to that, could you indicate, if you are able to now, what proportion of your research budget is being directed to replacing safely and efficiently and economically the current aviation kerosene?

Mr Beesley: Thank you for that question, which is very perceptive. We are often misunderstood, so thank you for giving us the chance to correct it. Yes, we are concerned about the environmental impact of all of our products. The point we were trying to make was that aviation is only 3% of fossil fuel use. It is growing faster than some others but on an absolute level it is very small and will remain so for some time. Because of all the constraints within the aviation industry, and we have mentioned some of them to do with the technical specifications required that the fuel remains safe and reliable and efficient, you can argue that the best use for what kerosene there is is in aviation rather than for other uses, power generation and land transportation to name but a couple. We are putting all of our effort through research and technology to make sure that the kerosene that we are burning is being done as efficiently and as cleanly as possible. That is the point we are trying to make but it is a complex argument.

Q388 Patrick Hall: I understand that, but it could look like, and it might actually be, because it is in everybody's interest to make fuel consumption more efficient whatever the fuel is, that you are relying on every other sector to directly tackle carbon change, CO_2 emissions and arguing that for the foreseeable future, and I am not quite sure how long that is, you did not answer my point about scientific research, the aviation industry does not need to do that. I think that would be a mistake if that was the position. It may well be the perception that people will draw from that position which perhaps you will think about. If you can answer it now, please do, if not maybe write, about the scientific research budget and what you are putting into looking beyond existing kerosene. Not just the efficiency because you have been doing that for decades.

Mr Clarke: That is right. It is a very interesting point. If we were purely an aviation company the answer to your question would be less than 1%. In terms of what we are investing directly of our funding in alternative fuels to kerosene for aviation the answer would be less than 1%. If you look at what we are investing in efficiency from our research programme the answer is more than 70%. Efficiency of fuels is absolutely crucial. On the specific issue of alternative fuels the answer is a very, very small number for aviation but it is worth recognising we are not just an aviation business, we are also involved in ground based power in terms of power generation, we do power systems and propulsion systems for marine application, and in those areas we are looking for alternative fuels because those are areas where there is a clear opportunity and a clear demand from customers for alternative fuels, whether it is gas-based or liquid-based fuels. In those areas we work primarily on non-kerosene fuels, it is gaseous-based fuels that we are interested in, and diesels as well. What we are seeing is the investment we make in those areas and in the technology groups that work in those areas feed through into our aviation activities over the longer term. It is important to recognise that it is not just aviation activity gas turbines, in the gas turbines we use in the aerospace industry and our product range we use derivatives of the same products in those other sectors, so there is a high degree of commonality across those markets for us. We can take the technology that is developed in one area and use it, generally with some modification, in one of the other sectors. The answer on alternative fuels is clearly we are working on that at the moment in the other sectors where there is a clear market driven potential to go into those areas with alternative fuels, whether it is a conventional fossil fuel or whether it is a biofuel or hydrogen. Our latest business sector is around fuel cells, not for transport applications but for ground based power applications where we have a solid oxide fuel cell system in development at megawatt scales which are going into those.

Q389 Sir Peter Soulsby: In your paragraph ten you referred to the Sasol plant and the production of synthetic kerosene. The impression given there is that this fuel does have a future, and I mean to aviation. That is how I am reading it. If that is so, and that is what you say there, why do you feel that is not being reflected more in your medium or long-term investment and research plans?

Mr Moran: Synthetic kerosenes are different. One thing we can do with the Sasol process is it gives us the opportunity to tailor make a fuel that is tailor made to the kind of combustion process that we have. At the present time Jet A1 is a highly polished fuel but it comes along with some things that we do not like. It has got polycyclic aromatics in it, it has got benzene rings, things that we do not like in there. Those produce soot and smoke particles. You do not see very many soot and smoke particles from modern gas turbines but they are still there at the very small level. What the Fischer-Tropsch process allows you to do is tailor make a fuel that will not have those polycyclic aromatics in it. Therefore, the ability to make those precursors to smoke that come from benzene rings and polycyclic aromatics are not there any more. As far as PM2.5s and PM10s are concerned, the aim to use something like a Fischer-Tropsch kerosene would be a far nicer thing to do. We may also be able to increase the power density of the fuel as well using the Fischer-Tropsch methodology. One of the things that we find difficult with the biofuels is this oxygen molecule that comes along for free but does not produce anything with regard to heat output. What that means is when looking at a blend of 20% of this biodiesel along with

kerosene, for example, there is a 25% reduction in overall heat output. That means we would have to burn 25% more fuel. Going to Fischer-Tropsch fuel we may be able to increase the power density of the fuel, not by very much but we would be able to tailor the fuel to give us more energy, so one, two, three, four per cent maybe of energy increase, and obviously that is really worthwhile.

Q390 Mr Drew: Can I go back to what Mr Beesley was talking about. I think it is fair to say the last time we were in Brussels the airline emissions issue was not seen as unalloyed success, let alone future joy ringing from the corridors of power there. Who are the good guys? Who are the bad guys? I do not mean just in terms of countries, but the carriers, the manufacturers like yourself. I know it is a complicated issue. It is symbolic in terms of the world becoming a bit more serious about emissions, is it not, and if we do not get this right then the rest is mere chattering in the background.
Mr Beesley: You are asking me a question that could take me into dangerous territory with some of our customers, so I will have to be slightly diplomatic in my answer.

Q391 Mr Drew: That is why I asked it!
Mr Beesley: Obviously all of the aircraft operators have to fly to global standards with essentially the same equipment and really there is not a lot different in the way that they use our products so in one way the answer is there are no good guys or bad guys, they are all pretty much the same. The UK is blessed with some of the good guys in that some airlines do report their emissions from their airline operations and some do not. You can look at British Airways as an example of a good guy.

Q392 Chairman: Is the United Kingdom Government through its fiscal and other financial policy doing enough to assist the more rapid development of the technologies you have described, both in terms of next generation of engines and next generation of aviation fuels?
Mr Beesley: The motivation to develop new technology for aviation has been there all the time. Even if fuel was free we would be under pressure to improve fuel efficiency simply because if you can carry less fuel not only are you saving money but you can fly your aircraft further or replace some of the fuel with greater payload, more paying passengers. There is a built-in multiplier effect on the cost model of running an airline if you can use less fuel. The motivation is there and always has been and it has been increased recently through the very rapid increases in fuel price.

Q393 Chairman: Part of the reason I ask you that is you have made very strong emphasis in your evidence about the longevity of the asset.
Mr Beesley: Yes.

Q394 Chairman: You also disappointingly—I do not say this critically—have told the Committee that retrofitting aircraft of an existing specification with more modern engines is not financially viable. The reason I asked about the fiscal aspect was whether you felt from the airline operator's point of view that a more generous regime of write-down could speed up the turnover in age terms of the fleet thus enabling the fruits of your labours to be incorporated in new aircraft quicker.
Mr Beesley: Part of the reason it is difficult to change an aircraft is the number one priority, which is safety. Aircraft are certified at the time that they are first designed and first flown. To change that aircraft in any way, whether it is part of an engine or a type of fuel, takes an incredible amount of certification safety work in order to get that allowed. The costs of doing that are often prohibitive for all but essential changes.

Q395 Chairman: One final question in terms of the engine design. You talked about your long-term objective of a 50% reduction in fuel burn over quite a long time period. Does that mean that engine design is going to improve incrementally or does there come a point—a point you made earlier about the nature of materials operating at their limit—at which new types of engine, perhaps even non-metallic types, may offer a quantum leap breakthrough in terms of fuel consumption?
Mr Beesley: Can I put that target in context? We are talking about 50% for the aviation industry, the system, between 2000 and 2020. We have broken that 50% target down into the different parts, although it has got to be the system working together that delivers it. Our part as the aero engine manufacturers is 20%. There is another 20% to come from the airframe and another 10% to come from better air traffic control allowing the aircraft to waste less fuel. Our part of that target is 20%. The Trent 1000 engine for the Boeing 787, which enters service in 2008, so that is less than halfway through that time period, will be 12% better than our baseline, so we will be more than half the way in less than half the time. Having said that, it does get increasingly hard because the better you get as you approach the laws of physics there are limits. We believe that 20% is a challenging but realistic target for 2020. There is some small further improvement to come after that date.

Q396 Chairman: After that are we looking at a complete quantum leap in what constitutes a modern gas turbine engine?
Mr Clarke: The reality is in terms of what you see on the wing, or it might be above the wing in many cases, it probably will not look that different but in terms of what is inside it, will it be non-metallic, there will be non-metallics in there, I am sure, but there will still be some parts which will be metal for both safety reasons and life reasons because it is too difficult to do in ceramic. To give you an indication:

we have been running ceramic systems in research and development and production for 35 years. Mr Beesley and myself have both been in it for 20 years and they are not in production yet, other than in one or two components. It is a very long, challenging job. That is the other thing about the kinds of things we are talking about, the research timescales are not a few years. Like the fuel cells, this is ten, 20, 30 years. You will see it but you will not see it physically on the outside of the engine.

Chairman: Both from the automotive and aviation standpoints you have brought a well-informed dose of realism to our consideration of how we address the question of greenhouse gas emissions and the use of biofuels in both the worlds of road transport and aviation, for which we are grateful. May I thank you both for your written evidence, which was of a high quality and very helpful to the Committee. If there is anything that subsequently occurs to you that you would like to write to us about following questions, we are always open to further input. Thank you very much indeed for coming and for your patience in answering our questions this afternoon.

Supplementary memorandum submitted by Ford Motor Company

1. Subsequent to the oral evidence Ford Motor Company gave to the Committee on 3 May 2006 we were invited to submit further information covering our perspective on future environmental technologies in the motor industry.

2. We regard climate change as the single most important challenge facing our industry. Ford Motor Company has already made substantial progress in reducing CO_2 emissions from new vehicles across all of its brands. As an example the Ford's new car fleet average has reduced by 21.7% in the period between 1995 and 2005. As we further reduce CO_2 emissions the associated technology inevitably becomes more advanced and the incremental gains more expensive to deliver.

Portfolio of Technology Initiatives

3. The scale of the challenge means that it is not enough to rely on one or two new "flag ship" environmental technologies in isolation but rather to drive down emissions with a portfolio approach. In this way it will be possible to deliver the maximum environmental benefits in the most affordable way. There is no single "silver bullet" or an easy technology fix. In order to properly address vehicle CO_2 emissions Ford Motor Company believes that action across a range of technologies is required.

Conventional Engine Development

4. Within the next ten years we envisage that conventional gasoline and diesel engines will continue to offer significant potential for further efficiency gains. Improvements in fuel economy and CO_2 emissions will be achieved through boosting (turbo charging), down-sizing (reduced engine capacity), improved valve trains, advanced combustion and direct injection.

5. Diesel already offers the advantage of low CO_2 emissions, but the next generation of diesels will utilize further improved high pressure fuel injection systems combined with variable geometry turbo charging and latest generation electronic engine management. Advanced combustion processes will help address regulated emission problems and improve fuel economy further.

6. Direct injection (DI) gasoline technology presents a significant opportunity. Downsized and turbo charged direct injection gasoline engines will provide levels of economy close to today's diesel whilst still meeting the performance and drivability criteria demanded by the customer.

Weight Saving

7. Lightweight architectures and enhanced vehicle design also offer real opportunities in the near to medium term. Jaguar currently leads the industry in pioneering the use of lightweight architectures with the all aluminum XJ and recently launched XK sports car. Both vehicles are best in class on weight and are highly competitive on fuel consumption/CO_2 emissions.

Hybrid Technologies

8. We are also examining the entire range of hybrid vehicle possibilities. The "micro" hybrid has limited regenerative braking capability, offers start/stop functionality and uses a belt-driven generator (belt-ISG). "Mild" hybrids, typically with a 36 or 42 volt system and a crank-driven integrated starter generator (crank-ISG), offer in addition to the start/stop function, modest launch assist and regenerative braking. The "medium" hybrid (with a higher voltage electrical architecture) offers increased power assist and full

regenerative braking. The "full" hybrid additionally offers all the above functions plus electric launch and drive. Ford currently produces the Escape Hybrid in the US market. It is Ford's first hybrid and is a "full" hybrid design delivering a 33% improvement in fuel consumption over the conventional V-6 Escape.

Alternative Fuels

9. Alternative fuels will form an increasingly important part of our future strategy. The success of the Ethanol Focus together with the recently introduced Volvo S40 and V50 flexi-fuel versions in Sweden demonstrates the opportunities that exist where infrastructure and incentives are provided to "kick start" the market. Ford is looking at developing further E85 models. In addition, we are examining the engineering changes necessary to upgrade all vehicles to make them E10 and B10 capable providing significant CO_2 benefits on a well to wheel basis.

10. To summarise, Bill Ford has stated that, "innovation is a compass that will guide our future direction" and that is clearly true with regards to reducing vehicle CO_2 emissions. In the near term our efforts will focus on further improving the efficiency of gasoline and diesel internal combustion engines, together with actions in other areas. Affordable hybrids will play a part as will further advances in lightweight architectures and other technologies.

11. Advanced vehicle technologies together with cleaner and alternative fuels from the fuel industry are only part of the solution, as is improved driver training, improved road infrastructure and Government support. Ultimately we need an integrated approach where all stakeholders are committed to working together to reduce CO_2 levels. Our other key message for Governments is that we need a stable fiscal and legislative environment enabling competing environmental technologies to flourish.

Ford Motor Company

June 2006

Wednesday 10 May 2006

Members present:

Mr Michael Jack, in the Chair

Mr David Drew
Lynne Jones
Daniel Kawczynski
David Taylor
Mr Shailesh Vara
Mr Roger Williams

Memorandum submitted by the Department for Environment, Food and Rural Affairs (Bio 26)

BACKGROUND

i. Defra supports the use of biomass sources for the generation of heat and electricity and the production of transport biofuels. Bio-energy contributes to climate change targets through reductions in greenhouse gas emissions and promotes sustainable development. Bio-energy offers opportunities for farmers, rural areas and sectors linked to farming, and can make a contribution to fuel security.

ii. This Memorandum incorporates the views of the Department of Trade and Industry (DTI) and the Department for Transport because of the close relationship between the departments on bio-energy policies. The response to each question posed by the Committee is as follows:

Q1. *What is the real scope for biomass and biofuels to contribute to tackling climate change? What proportion of the UK's energy and transport fuel needs could they provide?*

1.1 The Government believes that biomass has the potential to provide a significant contribution to the reduction of carbon dioxide levels if it is substituted for fossil fuel in the generation of heat and electricity and transport biofuels.

1.2 The work of the Biomass Task Force (see paragraph 5.1(ix)) has shown that the potential of biomass to reduce UK carbon dioxide emissions and mitigate climate change is significant. The "Renewables Innovation Review", published by DTI and the Carbon Trust in 2004, assessed the potential development of biomass energy and concluded that biomass, including purpose-grown crops, agricultural and forestry by-products and residues, could contribute 5–6% of the UK's electricity supply by 2020. The "Biomass Sector Review" by the Carbon Trust, published in October 2005, concluded that there is significant potential to reduce carbon dioxide emissions today through the use of biomass, particularly for heat generation. The report concluded that using UK resources alone, carbon savings of up to 5.6 MtC per annum could be delivered.

1.3 The UK is actively promoting biofuels and other renewable fuels primarily for climate change objectives. Biofuels, and in the future, other renewable fuels, have the potential to reduce carbon emissions from the transport sector. Life cycle analysis considering UK-produced biodiesel shows a typical carbon savings of around 55% compared to fossil diesel, but actual savings can vary widely, particularly for bioethanol. "Second Generation" technologies can offer much higher carbon savings, potentially making them entirely carbon neutral. The Government has announced that a Renewable Transport Fuels Obligation will be introduced which will require 5% of fuel sales in 2010 to be from renewable sources (see paragraph 5.2 (iii) for further information on this). This will save around one million tonnes of carbon a year: more than 2.5% of road transport emissions.

1.4 The UK has the land capacity to supply 5% of road fuels today. With advances in technology, it is estimated that by 2050 the UK could produce as much as one third of its transport energy needs from biomass.

Q2. *How cost-effective are biomass and biofuels in comparison with other sources of renewable energy?*

2.1 The Government's domestic targets are to cut carbon dioxide emissions by 20% by 2010 and by some 60% of current levels by about 2050, in line with the recommendation of the Royal Commission on Environmental Pollution. In order to meet these targets, a package of integrated policies will be needed, supporting a broad range of renewable energy sources including bio-energy, wind, solar, wave, tidal etc. A key advantage of bio-energy, unlike other renewables, notably wind, is that it is capable of providing continuous output once a robust fuel supply infrastructure is in place.

2.2 A study by the Carbon Trust on biomass concluded that using biomass for heating via combustion and displacing fuel oil gives the most cost-effective carbon savings, and is the closest use to being economic without subsidy at the present time.

2.3 Burning crops for energy is generally more efficient than producing transport biofuels as the crops have higher energy yields, lower chemical inputs and a more favourable balance between the energy obtained on utilisation compared with that used during growing. Although biofuels are more expensive than some measures for saving carbon (such as biomass energy and domestic insulation), they are comparable with others (such as offshore wind). With prevailing high oil prices, biofuels become more cost effective and, in the future, advanced technologies should see higher carbon savings and lower costs. The options for reducing carbon in the transport sector are limited and low carbon transport fuels will almost certainly be required if the Government's 2050 target is to be met.

2.4 On 23 January, DTI launch a consultation document "Our energy challenge: securing clean, affordable energy for the long term". This seeks views on the medium and long-term energy policy issues to be considered in the Energy Review. The 2003 Energy White Paper—"Our energy future—creating a low carbon economy"—set out the Government's goals and long-term framework for energy policy. The Energy Review will assess progress against these goals and the options for further steps to achieve them. The Review has a broad scope and will consider aspects of both energy supply and demand.

Q3. *How do biofuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?*

3.1 Table A below shows some general greenhouse gas (GHG) savings for a range of biomass technologies compared to their fossil fuel counterparts. Where other renewables such as wind, wave, tidal and photo-voltaic are concerned, effectively these are zero GHG emitters, achieving a 100% saving (although there should be some account taken of energy invested in developing and servicing units, this is small when expressed over the lifetime of generation). Biomass energy sources are carbon neutral in the sense that they take carbon from the atmosphere, but there is an annual investment in energy use and inputs to grow and process the crop—so there is an ongoing GHG emission associated with growing crops, and in producing inputs for the crop, which reduces the value of GHG savings.

Table A

1. Transport fuels	*Kg CO_2 equivalents emitted/GJ in fuel*	*% saving in GHG v fossil fuel reference*
Ultra Low Sulphur Diesel	*87*	
Biodiesel from OSR	41	53%
Biodiesel from recycled veg oil	13	85%
Ultra Low Sulphur Petrol	*87*	
Ethanol from wheat grains	29–45	49–67%
Ethanol from sugar beet	40	54%
Ethanol from wheat straw	13	85%
2. Electricity generation	*Kg CO_2 equivalents/GJ energy generated*	*% saving in GHG v fossil fuel reference*
Grid electricity	*162*	
Electricity from straw	66	59%
Electricity from miscanthus	26	84%
Electricity from SRC wood chip	25	84%
Electricity from forest residue	22	86%
Gasification of forest residue wood chips	7	95%
Gasification of SRC wood chips	8	95%
3. Small scale heating	*Kg CO_2 equivalents/GJ heat energy generated*	
Oil fired heating boiler	*105*	
Combustion of woodchip	7	93%

Table based on information from:

"Carbon and energy balances for a range of biofuels options", Sheffield Hallam University 2003; and "WTW evaluation for production of ethanol from wheat", Low Carbon Vehicle Partnership, 2004.

Q4. *Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?*

4.1 In the UK and EU, crops grown for bio-energy or any other agricultural activity are subject to the same cross compliance requirements as all other crops. These requirements are designed to provide a sustainable basis for agriculture and reflect a number of environmental and other sustainability objectives. These are, in essence, a baseline of good farm management practices, based largely on existing legislation, and encourage responsible stewardship of the land.

4.2 As part of cross compliance, all farmers receiving the Single Payment are required to complete a simple risk-based soil management plan, named the Soil Protection Review. The review must be completed by 1 September 2006, and implemented from 1 January 2007. It should be reviewed annually. The Soil Protection Review, containing a template and associated guidance on how to complete the template, was sent to all farmers in England at the end of last year. There are three key components included in the review:

— Identification of any soil issues/problems on the farm;

— Record of measures already being taken or to be taken to minimise these issues;

— Reviewing success—update.

4.3 Defra has produced the enclosed best practice guidance booklets for growing short rotation willow or poplar coppice, and miscanthus as an energy crop ("Best practice guidelines for applicants to Defra's Energy Crops Scheme: Growing short rotation coppice", August 2004 and "Best practice guidelines for applicants to Defra's Energy Crops Scheme: Planting and growing miscanthus", March 2001). These booklets provide guidance on the choice of site, planting techniques, crop management and harvesting methods. The miscanthus guide is currently being updated and the revised version will be issued this year. Further information on short rotation coppice is available in the Forestry Commission Information Note "The establishment and management of short rotation coppice—a practitioner's guide" (Tubby and Armstrong, 2002).

4.4 The Home-Grown Cereals Authority is setting up a carbon accreditation scheme for bioethanol from wheat and sugar beet which will help to ensure that participating farmers use environmentally-friendly techniques to grow their crops.

4.5 As part of the Renewable Transport Fuels Obligation, the Government proposes to develop carbon and sustainability assurance schemes. The schemes would apply to fuels sourced in the UK, wider EU and at the international level. Obligated companies would be required to report on the level of carbon savings achieved and on the sustainability of their supplies. The Low Carbon Vehicle Partnership is commissioning a study to define the principal environmental criteria required to protect sensitive eco-systems and will prepare a draft environmental standard for biofuels.

4.6 The European Commission's Biomass Action plan sets out the Commission's proposals for research. This includes several actions with a biomass component, including considering how best to take forward research into the optimisation of agricultural and woody crops for energy purposes, and biomass to energy conversion processes, and research into second-generation biofuels, with an aim of improving their efficiency and cost-effectiveness.

Q5. *What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and biofuels?*

5.1 Various initiatives seek to promote biomass for heat and power generation:

(i) the Renewables Obligation requires electricity suppliers to source 15% of their electricity from renewables, including biomass, by 2015–16. Co-firing of biomass with coal in conventional power stations is permitted.

(ii) £66 million of funding has been allocated to develop dedicated biomass power stations, combined heat and power schemes, and heating boilers.

(iii) £12.5 million is available for household and community renewable energy projects, including biomass heating.

(iv) In the Pre-Budget Report in December 2005, the Chancellor announced that from 1 January 2006, a 5% reduced rate of VAT will apply to the installation of boilers fuelled solely by wood, straw or similar vegetal matter in homes and certain residential and charity buildings.

(v) The 2005 Pre-Budget Report also announced that from 1 January, biodiesel used for electricity generation would be exempt from duty.

(vi) Defra's Energy Crops Scheme, part of the England Rural Development Programme, was introduced in 2000 and made £29 million of assistance available to farmers in England to establish energy crops, short rotation coppice (SRC) and miscanthus and to set up producer groups for SRC growers. The scheme runs to 2006. The Government will consult on further measures to apply under the new EU Rural Development Regulation from 2007 onwards. Plantings to 2006 under the existing scheme are expected to lead to carbon savings of 11.3ktC in 2010. However, in addition

to the contribution to emissions reduction through fossil fuel substitution, the expansion of SRC additionally enhances on-site carbon stocks. In 2010, it is estimated that uptake of around 47 ktC will be associated with standing biomass stocks (stumps and roots).

(vii) The UK-wide Bio-energy Infrastructure Scheme provides grants for farmers, foresters and businesses to help develop the supply chain required to harvest, store, process and supply biomass to energy end-users. The Scheme supports purpose-grown energy crops (short rotation coppice, miscanthus and other grasses), straw and woodfuel (including tree management residues and sawdust).

(viii) The EU €45/ha Energy Aid payment, introduced in 2004, is available for energy crops grown on non set-aside land. 600 ha of short rotation coppice were claimed in 2005.

(ix) Despite the support available, the Government recognises that there are issues that make it difficult to encourage the confidence which farmers, community organisations and industry need before they will invest and take up the opportunities biomass energy can offer. As a result, a Biomass Task Force, led by Sir Ben Gill, was commissioned to look at the barriers to developing the sector and to recommend ways to overcome these problems. Their report was submitted in October 2005 and a cross-departmental team is currently looking at the recommendations. The Government will publish a full response by April 2006.

5.2 The following measures are aimed at promoting transport biofuels:

(i) The 20 pence per litre cut in the duty for biodiesel, introduced in 2002, and a similar cut for bioethanol, introduced in January 2005, has led to a significant increase in the production of biofuels. In the last three months of 2005, the provisional figures for biodiesel sales averaged three million litres a month and bioethanol sales averaged nine million litres a month. This accounts for 0.25% of total road fuel used.

(ii) The European Union's Biofuels Directive requires Member States to set indicative targets for the use of biofuels. The UK's 2005 target was 0.3% use of biofuels. This amounts to 12 million litres per month. The Government is awaiting the final sales figures for 2005 to see whether this target has been met. The Directive does not require the target for 2010 to be set until 2007.

(iii) In order further to develop supply, the Government announced on 10 November that it will introduce a Renewable Transport Fuels Obligation. It is anticipated that this will start in April 2008 and will require the major oil companies and importers to ensure that a growing proportion of their fuel sales are from a renewable source. By 2010, that proportion will be 5%, which will save around one million tonnes of carbon a year: more than 2.5% of road transport emissions. The target levels for 2008–09 and 2009–10 will be discussed at stakeholder workshops in January and February 2006 and the decision will be announced in the 2006 Budget. Further consultation with stakeholders on the detail of the Obligation will be taken forward over the next year.

(iv) The Government is looking at the potential for using fuel duty incentives to encourage the mixing of biofuels with hydrocarbons in the conventional refinery process. The Government intends that a pilot project should begin from 2006, subject to approval by the European Commission.

(v) The Government is also considering an enhanced capital allowance scheme for the cleanest (ie most carbon beneficial) biofuel processing plants. Such a scheme would allow 100% of first year qualifying spending to be written off against taxable profits. The allowances will be for plants which manufacture fuel to a more carbon beneficial standard than conventional processes by:

— incorporating environmentally beneficial processes, such as combined heat and power which can recycle waste heat to provide heating or electricity, or the use of renewable power produced specifically for use on site; or

— using designated "advanced processes", such as the processing of ligno-cellulosic feedstocks.

The aim is to have the scheme up and running for April 2007, subject to State aid agreement. The scheme is not expected to result in an increase in the production of biofuels but it is predicted that around 50% of the UK production will be incentivised by the scheme, leading to processors switching to "cleaner" technologies than would otherwise have been used.

(vi) Regional Selective Assistance grants for capital investment in production plants are already available from the Regional Development Agencies.

(vii) Farmers can claim the €45/ha Energy Aid payment for energy crops grown on non set-aside land. In the first year of the scheme in 2004, the payment was claimed on nearly 33,000 ha of oilseed rape for biodiesel production. In 2005, there over 39,000 ha of oilseed rape.

5.3 The following measures are aimed at promoting both biomass and biofuels:

(i) The first phase of the EU Emissions Trading Scheme started on 1 January 2005. The scheme aims to reduce emissions of carbon dioxide at least cost to industry. Member States set an emissions cap for all installations covered by the scheme. Participants are allocated tradeable emissions "allowances". Each installation covered by the scheme must surrender sufficient allowances to account for its annual emissions (where one tonne of carbon dioxide is equivalent to one

allowance). The UK National Allocation Plan for the first phase of the scheme aims to reduce carbon dioxide emissions by around 65 million tonnes carbon dioxide (around 8%) below projected emissions over the next three years. Emissions from the combustion of bio-energy fuels are included in the scheme, but are zero rated and so are not required to surrender allowances for these emissions/fuels. Therefore plants burning bio-energy need only to surrender allowances equivalent to the emissions from any fossil fuels also being burnt.

(ii) The European Commission's Biomass Action Plan explains that the Commission intends to carry out a fundamental review of its energy policy which will be the subject of a Green Paper in Spring 2006. The document does not contain legislative proposals but lists, in an Annex, a series of actions which the Commission will take. These include proposing new legislation including amendments to the Directive on renewable transport fuels (including requiring that only biofuels whose cultivation complies with minimum sustainability standards will count towards the market share targets), reviewing the impact of existing measures, encouraging member states to give more emphasis to biomass in national policies, bringing forward a forestry action plan, reviewing waste legislation and encouraging bio-energy through research. The Commission estimates that these measures could lead to an increase in biomass use to about 150 million tonnes oil equivalent in 2010 or soon after. This would more than double the EU's 4% share of energy needs which is currently met from biomass.

Q6. *What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?*

6.1 This is presently being considered. Following the final report of the Biomass Task Force in October 2005, its findings and recommendations are now being studied by the cross-departmental team and will be used to inform and guide future policy development in the sector. The Government will publish its detailed response in April 2006. The Government will also be considering the work of DTI's ongoing Energy Review, and the Climate Change Programme Review.

Q7. *What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?*

Biodiversity and the environment

7.1 Crops grown for bio-energy or any other agricultural activity are subject to the same cross compliance requirements as all other crops (see paragraphs 4.1–4.2).

7.2. Biomass crops planted under Defra's Energy Crops Scheme are subject to an environmental assessment before planting to include landscape, archaeology and wildlife considerations. If the intention is to plant on uncultivated or semi-natural land, the application will be subject to a screening test under the Environmental Impact Assessment regulation, before a decision is made on whether planting can go ahead, or further assessment, consultation or detail is necessary. Applications are placed on a public register which can be viewed by organisations or members of the public.

7.3 R&D projects funded by Defra are looking at pest and disease biology and host/pest interactions to support the development of non-pesticide control strategies.

7.4 For crops such as short rotation coppice (SRC) and miscanthus grown for heat and power generation, fewer chemicals are required than for growing arable crops once the initial weed control required to establish energy crops is completed. Research suggests that, in comparison with arable crops, energy crops encourage bio-diversity, although some of the species may be different to those normally found on arable land. Research on short rotation coppice plantations by the Game Conservancy Trust found that the crop can have biodiversity benefits compared to arable crops. Some key results were:

— Higher densities of birds during the summer in the SRC plots;

— Migrant bird species such as warblers were as high on the edge of SRC as in surrounding hedgerows;

— Recently planted and cut-back SRC plots supported higher numbers of open ground species such as skylarks and lapwings than the arable control plots;

— More butterflies were recorded in the managed and sheltered headlands of the SRC plots than the arable plots.

7.5 Other research has found that species of high conservation value such as bullfinch, reed bunting and song thrush have been noted regularly to hold territories in SRC during the breeding season.

7.6 Currently, the UK's supply of biodiesel comes from recycled waste vegetable oil, animal fats and imports, and bioethanol comes from imports. However, companies are now looking to produce biofuels from UK-grown crops such as oilseed rape, wheat and sugar beet. Currently, the crop varieties grown for

biofuel use are the same as those grown for food use. The crop management is therefore broadly the same as for food crops although the quality and grain protein specifications may be less demanding, allowing some inputs, such as nitrogen, late fungicides and insecticide applications to be reduced.

7.7 Most biofuel crops will be grown in rotation as part of a mix of several crops on the farm. A study by Defra's Central Science Laboratory found that biofuel production from a mix of feedstocks and replacing crops for food would have a neutral effect on biodiversity. Any replacement of spring sown break crops with winter oilseed rape would have a negative effect on crop diversity and farmland birds. If arable crops replaced natural-regeneration set-aside, this would reduce habitat diversity. In the longer term, as technology improves, ligno-cellulosic feedstocks such as straw, wood and waste paper could provide raw material for bioethanol production without significantly affecting biodiversity.

Impact on production of food crops and land use

7.8 At present, most energy crops for heat and electricity generation are grown on set-aside land but purpose-grown energy crops are not the only source of biomass. In the future, approximately half the biomass needed could come from agricultural by-products such as straw or woodfuel from forestry operations or arboricultural tree management operations, such as thinnings and trimmings, and co-products from sawmills and other wood processing plants, such as offcuts, slabwood, bark, chips and sawdust.

7.9 For the longer term, Defra's R&D funding (of around £600,000 per annum) underpins an expansion in the commercial breeding programme for biomass energy crops. This aims to double the output of new varieties by developing crops which combine the exploitation of elite genes to maximise yield potential with the use of a diverse range of resistances to fungal diseases and pests.

7.10 UK agriculture could have sufficient capacity to provide crops to meet 5% of total UK fuel demand. While some biofuel crops are likely to replace food crops, there are significant quantities of oilseed rape and wheat that are currently exported which could be retained for domestic biofuel use, with no loss to UK food production. At present, most biofuel crops are grown on set-aside land but in the longer term, there is a question mark over the future of the scheme.

7.11 In the longer term, ligno-cellulosic crops have potentially much higher energy yields per hectare than traditional biofuel crops and therefore could produce larger quantities of fuel from a much smaller land area. There is also the potential to use waste material such as straw and waste paper.

Q8. *Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?*

8.1 There are many types of non-food crops which can contribute positively to sustainable development, as described in "A Strategy for non-food crops and uses", published by Defra and DTI in 2004. The Government favours a diverse approach in order to maximise the benefits from a wide range of renewable materials, for example in the chemicals, pharmaceutical and construction industries. It is likely that in terms of volume, bio-energy crops will be the predominant non-food crops in the short and medium term. There is much interest in the "biorefinery" concept under which plants are used to produce fuels together with other chemicals and by-products in an integrated process. This is likely in the future to form a highly sustainable means of utilising crops to produce a range of products from renewable materials while contributing substantially to energy objectives.

8.2 The Government encourages UK farmers to grow crops for the production of energy as this offers diversification and new market opportunities for farmers and can help create jobs in rural areas and new income opportunities in, and linked to, farming. Bio-energy can also make a contribution to UK fuel security. A study by Defra's Central Science Laboratory study found that the production of biofuels from UK crops has a net beneficial impact on the UK economy due to the incomes that are generated in the agricultural, manufacturing, engineering construction, retail distribution and transport haulage sectors. There is additional employment where crop feedstocks are grown on set-aside land as more labour is invested in crop production than in maintenance of set-aside. About two farming jobs are created (or sustained where crops substitute for other cultivation) for each 1,000 tonnes of biodiesel produced. Bioethanol production from wheat and sugar beet would generate around 5.5 jobs/1,000 tonnes of bioethanol production. Additional jobs would be created in biofuel processing. A 100,000 tonne biodiesel plant would employ in the region of 62 staff in processing and blending industries. A similar sized bioethanol plant would employ 50–55 staff, plus a further 16–28 in fuel blending and transport.

8.3 However, biomass and biofuels are internationally traded commodities and the Government recognises that imports are likely to continue to take a share as the UK market develops. It is important to ensure that both imported and domestically sourced fuels do provide greenhouse gas savings and are produced sustainably.

8.4 The European Commission's biomass action plan gives a commitment to consider requiring that, through a system of certificates, only biofuels whose cultivation complies with minimum sustainability standards will count towards Member States' indicative targets under the Biofuels Directive. Such a system of certificates would need to apply in a non-discriminatory way to domestically produced biofuels and imports.

Q9. *What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?*

9.1 In so far as the by-products of agriculture and forestry are waste, the Government's waste objectives are to reduce landfill and manage waste in line with the waste hierarchy. This prioritises recycling and composting over energy recovery although each of these options has a role to play Defra will shortly launch a consultation on the revision of the existing Waste Strategy for England.

9.2 The UK only harvests 47% of the annual growth increment of its forests. While not all of this timber would be available to the woodfuel market, it indicates significant potential for expansion. 9.6 million m^3 of softwood timber is currently harvested annually from UK forests and is forecast to rise to 16 million m^3 by 2020. The best quality timber will continue to go to higher value uses such as sawn timber and veneer. But significant quantities of small round wood and co-product from sawmills could become available for energy use as the wood panel industry and paper mills convert to using recycled material. In addition, forest residues up to a maximum of 1.5 to two million oven dry tonnes per year is potentially available.

9.3 Current estimates for all types of wood waste vary from 1.9–7.5 million tonnes per annum. This includes municipal, commercial, industrial, construction and demolition waste. A significant proportion currently goes to landfill, which could be used instead as a valuable energy source.

9.4 The key barriers to supplying woodfuel are the market price for biomass and the development of the skills and infrastructure to bring it to the energy end-users. Currently there is a gap between the electricity price and the resource cost for biomass which will need to close for this material to become available. Funding for developing woodfuel supply chains is available under the Bio-energy Infrastructure Scheme. The planting of new woodlands and the sustainable management of existing ones are currently promoted under grants available from the Forestry Commission.

9.5 The use of meat and bone meal, tallow and slurry in energy generation is permitted under the Animal By-Products Regulation and the Government is keen to encourage the use of these valuable energy sources. The Renewables Obligation requires licensed electricity suppliers to source at least part of their electricity from renewable generation. The use of meat and bone meal and the anaerobic digestion of slurry for the generation of electricity are eligible sources of renewable energy. Detailed guidance on the anaerobic digestion of slurry has been provided to industry.

9.6 The Biomass Task Force made a number of recommendations that relate to the use of waste material from industry, agriculture and forestry as an energy source. These recommendations are being considered by the cross-departmental team.

9.7 As part of the review of the Renewables Obligation, the Government recently consulted on options for incentivising a broader range of mixed waste energy projects.

Q10. *What lessons can be learned from other countries' experience in the production and use of bioenergy?*

10.1 A report by the EU Renewable Energy Action Plan (REACT) programme demonstrates that, internationally, successful policies depend on a comprehensive and consistent approach over the medium-term (six to seven years). This can involve substantial financial recourses, and economic incentives have been a feature of every successful case of market development. Even so, regulations can be an effective and cheap measure.

10.2 The key lessons which emerged from the Biomass Task Force's assessment of international comparisons include:

- A consistent approach to support in Austria led to the installation of over 850MW of biomass heating since 1994.
- In Finland and Sweden, fossil fuel taxes for heat production have been shown to be an efficient and effective way to make bioenergy competitive.
- Some countries have pursued policies of higher energy prices which have encouraged investment.
- An absence of targets, coupled with fragmentation between national and regional government and low energy prices have undermined the development of biomass energy in Canada.
- Tax reducing policies in Denmark introduced uncertainty about the commitment to future support, and undermined confidence in the market for renewable energy, leading to a rapid decline in investment.
- The creation of local ownership, both of the installed equipment and the concept, has underpinned the development of district heating in Sweden.

10.3 The G8 Summit, chaired by the UK at Gleneagles last year, agreed a plan of action on climate change, clean energy and sustainable development. This set out a wide ranging programme for international collaboration and included a commitment to launch a Global Bio-energy Partnership to support wider, cost-effective biomass and biofuels deployment. The UK is closely involved in establishing the Partnership, which is expected to be launched in March 2006.

Department for Environment, Food and Rural Affairs

February 2006

Witnesses: **Mr Andrew Perrins,** Head of Industrial Crops Division, Department for Environment, Food and Rural Affairs, and **Mr Martin Johnson,** Head of Transport Taxes Branch, Environment and Transport Taxes team, HM Treasury, gave evidence.

Q397 Chairman: Good afternoon, ladies and gentlemen. This is the final session of the Committee's inquiry on renewable energies and the role particularly of bioenergy. I am very glad to welcome representatives from the Treasury and from Defra. Mr Johnson, what is your official title, for the record?
Mr Johnson: I am Head of the Transport Taxes Branch of the Environment and Transport Team in the Treasury.

Q398 Chairman: That must mean, Mr Perrins, that you are from Defra, and I think you are the Head of the Industrial Crops Division; is that right?
Mr Perrins: Yes, sir.

Q399 Chairman: Splendid. You are both very welcome and thank you for coming to give evidence to the Committee. I would like, Mr Johnson, to start with you because it would be helpful if you would say a few words about the strategic context in which the Treasury sees the development of biofuels and, if it does not embarrass you, can you give us any insight as to whether any of your Treasury ministers have made any speeches which help to contextualise the approach to the use of bioenergy?
Mr Johnson: First, thank you very much for the invitation to the Committee. With regard to the strategic context for the development of biofuels, what I would say is that the Government has a very clear policy to reduce greenhouse gas emissions. It has its Kyoto obligation and its domestic targets, the 2010 targets, to reduce CO_2 by 20% on 1990, and the longer term goal in relation to 2050. You can break down the economy into different sectors. Obviously, one of those is transport which is responsible for about a quarter of greenhouse gas emissions and the strategic context for the development of biofuels is very much one of the key ways of reducing emissions from transport over time.

Q400 Chairman: Let me just stop you. You used the word "key". How do we rank in the various stratagems the use of biofuels?
Mr Johnson: There are different measures that Government has used, both in the Energy White Paper in 2003 and then in the review of the Climate Change Programme this year. You can look at measures like the lifetime cost of carbon abatement per tonne of carbon and I think that would be the key measure that you would use. If you take in that measure things like domestic or business energy efficiency would score very highly. They would have a positive net present value. Things like onshore wind would score better than offshore wind, for example, and then you would have a ranking perhaps within transport where biofuels would be relatively competitive compared with, for example, the latest assessment of hybrid technologies or the use of hydrogen in internal combustion engines.

Q401 Chairman: Is that ranking that you have described in relation to a trade-off of carbon savings for every pound of the public purse that is used to stimulate the development of the particular area that you have described?
Mr Johnson: It is not so much the public purse; it is the resource cost to the economy so it is, if you like, regardless of whether it is from the general taxpayer or through consumer payment or whatever the funding route is. It is a measure of the resource cost and that is the analytical basis on which this is looked at.

Q402 Chairman: For example, when Sheffield Hallam did their work on looking at the relationship between what you got for each pound of public money spent on energy savings, loft insulation was streets ahead. You have talked about different returns. Is there a piece of paper on which somebody ranks all of these returns so that we can see where in the pecking order bioenergy comes? The reason I ask that question is that if you look at the second annex of the Biomass Task Force report there are two pages of itty-bitty little schemes stimulating this, that and the other thing. There are no outputs against it, in other words, what is the rate of return for this, what are we trying to achieve, how much carbon are we saving from the use of biomass in that context? Therefore, in terms of policy I am left wondering whether this is seen by the Treasury as a bit of a nuisance but something you have to do because it is all bitty and very difficult, whether it is an environmental necessity because you have to have a broad portfolio of routes in to reducing greenhouse gas emissions or whether you think there is a strategic benefit because it does affect energy security. I am still not clear where in that ranking the use of bioenergy comes. Can you shed a little more light on it?
Mr Johnson: The commitment to biofuels from the Treasury is very real. We brought in the duty incentive for biodiesel in 2002 and for bioethanol in 2005, and I think Treasury ministers, along with

those in the Department for Transport, Defra and DTI, have been very much at the centre of the policy development process and the Renewable Transport Fuel Obligation announcements, both in the PBR[1] and then at the time of the recent Budget, have been symbolic of the Treasury's engagement with biofuels. That is the first thing: the Treasury commitment on biofuels is genuine. In 2008–09 the cost of the 20p duty differential is expected to be about £300 million based on a market share of 2.5% biofuels. Just on that point, I think the commitment is real. In terms of the ranking point, you made the point about loft insulation. My understanding is that what you said is right: it is one of the very best things that you can do, but there are only so many lofts that you can insulate and you do need a broad range of policies, some of which deliver now, some of which deliver now but also—and this is the case for biofuels I think—should deliver more savings in future more cheaply, and that is where there is a strategic—

Q403 Chairman: You can see why I am asking the question, because one of the things we have to derive from the report is to talk about whether in fact we think the amount of support to pump-prime and stimulate this innovative and interesting area of energy is sufficient but it is very difficult for us to do that in an informed way unless we have something that enables us to rank it in terms of what we get for the expenditure. If there is any information you can give us to help us put into context what you have just said it would be helpful. You mentioned the 20p duty derogation. Why did you decide 20p was the right number?
Mr Johnson: The 20p has been there since 2002. I think the assessment that ministers made was that 20p was the right level which would balance on the one hand giving enough incentive so that you will begin to move the market, because if you do not do that then it is not worth having, but on the other hand balancing what is felt to be an acceptable cost to the Exchequer in exchange for the carbon savings.

Q404 Chairman: With respect, Mr Johnson, you have not actually answered my question. You said that ministers had decided. Ministers do not decide anything unless somebody gives them some information to make a decision upon, and somebody in your area of the world must have sat down and done a calculation because, for example, at the pump the price differential of biodiesel versus ordinary diesel is perhaps a pence or two a litre, hardly any difference between the two, notwithstanding the fact that there is a duty derogation of 20p. Some people suggested at the outset that it should be 27p or 30p; that was rejected, but I have never understood why 20p was deemed to be the right number.
Mr Johnson: Without wanting not to answer the question, I must say I was not in post at that time but my best guess would be that an assessment was done on the additional resource cost of biofuels and that 20p was viewed to be an approximation of the additional cost of production and therefore a fair duty discount to offer.

Q405 Chairman: That is an *ex post* rationalisation of it and it is not a bad stab but it might be the case that some could have argued that you needed to be a little more generous at the pump to encourage people prior to the arrival of the Renewable Transport Fuels Obligation to use this material against a background where, of the sectors where greenhouse gas emissions were rising, the domestic sector and the transport sector are the two which have been going up. If you cannot answer it now because you were not in post I fully accept that, but I think the Committee would find it very helpful to have a little more detailed information as to why 20 was deemed to be the right number and why, in terms of encouraging the uptake of this ahead of the RTFO, nothing more than 20p was given. Against that background you were very generous on LPG and as a result got an infrastructure in place and then gradually backed off the amount of discount, but you have not done that with biofuels and I think the Committee would be very interested to know about that.
Mr Johnson: I am happy to provide a note on that, and also, in terms of the ranking of policies, there is material that has been published but again I am happy to provide a note on that one which draws together the best material that we have on that.[2]

Q406 Chairman: You have taken a pretty hard line view on unprocessed biofuels. You have given no discount to encourage uptake of that at all. Why?
Mr Johnson: The requirement to get the 20p discount relates to the legislation in the Hydrocarbon Oils Duty Act. That legislation sets out a definition of "biodiesel" and it has four parameters. One is that the fuel must be of diesel quality; secondly, it must have an ester content of 96.5% or more; there is a sulphur limit, and also it must come from biomass sources. We announced at the Budget that we would review the definition as it stands but, to try and answer your question directly, the concern is on the one hand to reward fuels that offer an environmental benefit because we want to encourage those for the climate change benefits that they give you, but on the other responding to concerns that there might be, both from car manufacturers worried about engines, and indeed motorists, and then other biofuel producers who may have concerns about quality and a level playing field. You will be aware that there have been MPs, companies and others who have questioned the current interpretation that Revenue and Customs have made of the legislation in certain parts of the country. Plymouth Biofuels are one company in that position, with whom I had a meeting this morning as part of this review, but we said at Budget that we will look at this and we expect to do that over the summer.

[1] Pre-Budget Report

[2] Ev 183, A.

Q407 Chairman: What is the Treasury stance with reference to flexible-fuel vehicles? Ford and Saab have got these vehicles available. Ford are making them more generally available in the United Kingdom. Here we are moving to bioethanol as opposed to biodiesel and there is a novelty in the technology that is available: there are not warranty issues, the car is £200 more expensive than a normal one. Hardly an inducement to buy cars like that is given through the duty discount in terms of the road fund licence It is a bit half-hearted in response to a bit of really good technology. From the Treasury standpoint why are you not giving it a bit more of a push?
Mr Johnson: In countries like Brazil principally and Sweden increasingly within Europe this is a technology where the manufacturers and the infrastructure have responded. We know that in Brazil, for example, the great majority of new vehicles sold are flexi-fuel vehicles. Companies like Ford and Saab are now beginning to bring models onto the market. You have got the Somerset project going on. In terms of the Treasury's response, the Renewable Transport Fuel Obligation is the central government response to biofuels generally and the way that mechanism will work is that it will offer incentives for E85 as much as 5% blends, in that the way the certificate trading system works should provide some incentives for E85. To some extent it is up to the market how that biofuel, that 5% by volume, is distributed. I know we have had representations just recently to look again at the company car tax framework and to look at other incentives. Of course we will look at that, but one thing I would say is, okay, Sweden is ahead of the game, but this is a relatively new area within the rest of Europe. It is something which departments are beginning to look at seriously now and it is something that we intend to look more closely at over the coming months. The RTFO is the key mechanism which will support biofuels generally.

Q408 Chairman: But, for example, when the Government moved strongly to remove lead from petrol there was a very clear price signal given in the discount between the two forms of fuel. Here we have a virtually indistinguishable discount and nothing much else in the pot, and yet motor manufacturers have got some proven technology available in the market place. The point that is being made to us is that if you are going to get people to move to more environmentally friendly technologies you have to give them a little bit of inducement because it is new and novel. I suppose it is about sharing the risk. Let me ask this question. At Gleneagles it was said that ministers were going to be moved around in flexi-fuel vehicles. If it was good enough for ministers then what are you doing with the government car fleet? Has the Treasury said, "We have got to move to flexible-fuel vehicles in the government car fleet"? Has the Treasury got any?
Mr Johnson: I believe the Chancellor now has a hybrid vehicle.

Q409 Chairman: But not a flexible-fuel vehicle?
Mr Johnson: No, that is correct, but any more than that I could not tell you. That would be a procurement policy issue rather than one that would come to me. Ministers have certainly purchased greener cars, perhaps not flexi-fuel vehicles though.

Q410 Chairman: So we are a little bit behind the weekend at Gleneagles in terms of the Government. Let me just move to the conclusion of this section of the questioning. We have a buy-out price for the RTFO. I am interested to know what economic modelling the Treasury has done to see how much potential investment money at your 15p a litre discount is going to be generated as a result of this. In theory, if all the fuel companies were able to source properly there should not be any money from the buy-out, but how many do you know are relying on investment capital from the buy-out? Why did you settle at 15p? Why was that number chosen?
Mr Johnson: Maybe I can just take a step back and say a little bit about the package of announcements and how the different incentives will work together. What we announced at Budget was first the target levels for RTFO were 2.5% biofuels in 2008–09, 3.75% in 2009–10 and 5% in 2010–11. We announced that the duty incentive would be maintained at 20p in 2008–09, and that is the first year of RTFO. Then we also announced that the buy-out price would be 15p in 2008–09. That means that in the first year of RTFO you will have 20p duty incentive and you will also have an additional incentive of 15p per litre buy-out. What that means is that where companies fail to meet their obligation they will have to pay a 15p per litre penalty. That means that not only do you have a 20p reward but you also have an additional 15p disincentive, and if you take the combination of these two things that is a significant step forward from simply having a 20p incentive, which is where we are now. We also announced that that combination, that 35p, would be maintained in 2009–10 before reducing to 30p in 2010–11 but without specifying how the package would be split. To answer your question about who is relying on buy-out payments, the answer to that is that nobody should be relying on buy-out payments. The mechanism is not designed such that people should rely on payments. It is more that if people choose to buy out rather than meet the obligation they will have an additional penalty, if you like, which is that their rivals who have met the obligation will receive that penalty money—

Q411 Chairman: That does not actually answer the question I have asked though. You are doing a very good job of driving away from the question so let me bring you back. The question I asked was, why 15p? Why did you decide that was the right number? Let me add to that. In terms of the length of time that the capital assets involved in the production of biofuels would be operating do you consider that the timetable of the fiscal regime you have outlined is sufficiently long to give certainty to investors?

Mr Johnson: The way the 15p was derived was to do with a study which Climate Change Capital did for the Department for Transport last year. They recommended that a combination of support within the range of 25–30p was required to shift towards biofuels to make it economic. That was their view based on the additional resource cost of what companies needed. Ministers took the view that rather than just have a combination of 25–30p duty and buy-out they would go beyond that and offer a combination of 35p duty and buy-out in the first two years, so the 15p was added to the 20p that was there and got you to 35p, and that was more than the study that Climate Change Capital recommended. That was how the 15p was derived. It was based on the assessment that Climate Change Capital did and that Graham Meeks, who was with them at the time and I know has given evidence to the Committee, refreshed that analysis in his new role in January/February, and he came back to us and that evidence suggested that a package of roundabout 30p was sufficient. Ministers decided they would give this mechanism an additional kick-start and go a little bit further than the 30p with a 35p combination, and that was how the decision was arrived at.

Q412 Lynne Jones: What about the length of time that it is going to take?
Mr Johnson: Sorry; that was the other part of the question. You also asked about the long term nature of this package. I think it is important to say that in terms of duty the duty incentives are for three years. The view was taken by ministers, based on what they had heard from the industry and what they had heard from investors, that three years was insufficient to deliver in an industry where capital assets are basically repaid over up to 10 years. That is the key benefit of RTFO. That is why RTFO is a very significant step forward. You are talking about a long term mechanism. I think the DfT feasibility report talks about 15 years. This is a mechanism which gives the certainty to industry that they said they needed as well as the financial rewards that should reflect the additional cost of biofuels.

Q413 Chairman: Can I just ask whether the calculation that you do on these matters is updated to take into account what must be additional revenue coming back to biofuels producers by virtue of the rise in the hydrocarbon fuel price?
Mr Johnson: The short answer is yes, it is.

Q414 Chairman: It is an interesting question that comes out of this. When the 20p duty derogation was set, I think some two or three years ago, prices of hydrocarbon fuels were probably in the mid-70p's. Now they are nudging a pound. What calculations have you done to show the extra revenue that is going in? I go back to my point that the pump differential appears to be hardly any different and yet the margin above where these differential prices were set has widened perhaps to 10p or 15p a litre. Have you done any modelling to look at the increased cash flow? Am I right in thinking there should be increased cash flow?
Mr Johnson: At first glance you would think that would be the case. Where the complexity comes in is that increasingly we have seen the biodiesel market price start to track the crude oil price. What you have is that as the oil price rises the biodiesel price tends to follow it, so where you would expect to see a margin open up it does not necessarily happen. There is volatility in the biodiesel/biofuel market as there is in the oil market. In terms of the question on modelling, yes, it is updated. We do work with Defra, we do work with the RIA[3] and we do take account of this, but because of this tracking and the linkage that you can see between these prices these margins do not always operate in that way.

Q415 Chairman: But the raw material price for making the fuel has not followed the oil price, has it?
Mr Johnson: Not necessarily. I am not an expert on this.

Q416 Chairman: Mr Perrins, can you help us on that?
Mr Perrins: One factor that has changed on raw material prices would be the very high increase in the world sugar price we have seen over the last year which is a significant factor in determining the bioethanol price.

Q417 Chairman: But not biodiesel.
Mr Perrins: Indeed.

Q418 Chairman: That is the bit I am interested in because in terms of UK manufacturing capacity there is visibility on that. There is zero visibility on bioethanol.
Mr Perrins: The demand for biodiesel as well as bioethanol has also significantly risen on the UK market, the European market and the world market over this time frame. We are seeing, for example, very strong demand for raw materials around Europe, which would be rape seed, for example, or sunflower seed in Mediterranean countries, to go into biodiesel production which is moving ahead very rapidly in certain parts of Europe such as Germany and Spain. That demand increase is clearly impacting on the raw material prices and as a consequence the price of biodiesel itself.

Q419 Mr Drew: Speaking as someone who was persuaded to buy an LPG vehicle, we went through a similar problem in that the differential never grew because LPG seemed also to increase despite the fact that it is a so-called waste product. What is never taken account of is that you get a much lower level of performance from an LPG vehicle which means that you use twice as much of it. It is a nice notion that you really are encouraging the user by giving them a price differential but when you have got an existing vehicle and you just put biodiesel into the fuel I wonder whether it makes any difference to the performance which then counteracts the benefit you might get in terms of a lower price.

[3] Regulatory Impact Assessment

Mr Johnson: I think with biofuels at 5% blend, which I think is what you are going to see—

Q420 Mr Drew: But if you were to grow that, which we have got to if you are serious about it—
Mr Johnson: Biofuels have a lower energy content than fossil-based fuels, so if you get up to high blends, like E85, you can have a significant reduction and essentially you need more litres to go the same distance, but at the kinds of blends we would expect in the next five, ten, 15 years, that is not going to be a significant issue and ethanol has an oxygenating benefit which compensates for some of the calorific loss, so I think at low blends it is not an issue; at higher blends it is more of an issue.

Q421 Daniel Kawczynski: What has been fascinating listening to you is that you mentioned how far ahead Sweden is and you have acknowledged that we are significantly behind as a country.
Mr Johnson: Behind Sweden.

Q422 Daniel Kawczynski: And Brazil?
Mr Johnson: Yes.

Q423 Daniel Kawczynski: What was the strategy then, your strategy or your department's strategy? Did you genuinely want to encourage more ethanol production, because if that is the case you have obviously failed? In my county [Shropshire], which is the largest landlocked county in Britain, we have one petrol station where you can buy this fuel, and that to me is abject failure, so I just do not understand what the scenario is.
Mr Johnson: The Chairman asked at the beginning about the strategic context for the development of biofuels. I made the point that it is part of the climate change programme, it is part of the Government's response to climate change. It is a long term commitment that we are looking at. I think it is fair to say that the amount of biofuels you have now as a share of road fuels is 0.3 of 1%, that that is a very low level but we have said we will get up to 5% by 2010 and we would like to go beyond that subject to the European Commission changing the fuel quality standards after that. Where we are now is at mid-table in Europe but we would expect with this mechanism, which I think is a world-leading mechanism; the Commission have shown great interest in it, it is a long term mechanism, we would expect to move forward quickly. In terms of the Government's commitment, it is there. If you look at the response to the Budget announcements from people like Sean Sutcliffe, some of the bioethanol companies, Bioethanol Ltd, Losanoco, generally these are the real people on the ground. These are the people who are going to go and do this. They were positive about the announcements. It was not everything they wanted but they felt it was a step forward and that this is a viable business, and I think that is an important test.

Q424 Daniel Kawczynski: Consumers definitely want it and certainly a lot of people who speak to me in my constituency feel pretty strongly about wanting to use this new type of technology, and also farmers want to be able to grow the crops, and yet they tell me that there is very little incentive, as the Chairman indicated earlier, from a fiscal perspective, but also very little information going out to farmers as to what prices will be like. Will the 20p duty be maintained over a longer period of time? It is very difficult to enter a market if you do not have some form of information or stability. I am very concerned that the Government is giving very little incentive to farmers to go into this and to consumers to have the opportunity of buying it.
Mr Johnson: One of the objectives of the announcement at Budget time was to set this mechanism in a long term framework and to be clear what the targets would be, what the financial rewards would be. I said that the combination of duty and buy-out will be 35p in 2009–10, 30p in 2010–11, and on that basis we would now hope to see contracts being signed between biofuel producers and oil majors and between farmers and producers. It will take time to develop but the RTFO starts in two years' time and there is a lot of detail there now. We are trying to respond to what people have said to us during the stakeholder discussions about certainty, about clear signals. I fully take your point about a lack of activity up to now and where the market share is, but the announcements that are there and the policy which has been developed are designed to move us forward.

Q425 Chairman: Can we ask you about the second generation biofuels? The document *The Partial Regulatory Impact Assessment on an Enhanced Capital Allowance for Biofuels Production Plant* is a fascinating document and perhaps you could interpret this for us. First of all, is it the objective to stimulate second generation biofuels?
Mr Johnson: That is part of the objective. I would describe the primary objective of this scheme as stimulating investment in the cleanest biofuel production plant, which includes second generation plant.

Q426 Chairman: So all the ones that have been started will not qualify for this. What modelling have you done, because on table 3 of the document you have got a series of expenditure items? Perhaps you could make certain that the Committee understands what table 3 tells us.[4]
Mr Johnson: This is on page 16.

Q427 Chairman: Correct.
Mr Johnson: Does everyone have a copy of table 3?

Q428 Chairman: They probably do not because it is one of those things that I discovered on my voyage of exploration, having read the Red Book. I am most intrigued, by the way, that in "Measures to protect the environment" in the Red Book this thing does not appear although it does in the text, but that is only a minor point.

[4] http://www.hmrc.gov.uk/ria/eca.pdf (Page 16)

Mr Johnson: What the table does, just for the benefit of others, is that within an RIA you have to set out policy options, you have to have the objective up front and then say what the options are, and then you finish up by saying which policy lever you have chosen. Table 3 sets out the Exchequer costs of the different options around promoting the development of the cleanest biofuel plant. In the final option in the table, Chairman, 3(c), "ECA[5] based on eligibility criteria", you can see the numbers running across the right. These are the Exchequer costs which have been put into the public finance assumptions for this scheme, so the first year, as you can see, is 2007–08. That means that we expect the scheme to start in early 2007, so the first year in which we would incur costs would be that first year.

Q429 Chairman: Let us make certain that we understand what we are talking about in terms of the capital allowances. It is a scheme which gives you a 100% write-off potential in year one; is that right?
Mr Johnson: That is right, as opposed to 25% on a writing down basis.

Q430 Chairman: So if I come along and build a plant and I spend £25 million on the plant in year one, assuming by some piece of magic of engineering I can have it up and running, and I generate £25 million worth of profit, then I can offset £25 million worth of my capital expenditure against my £25 million of profit; is that right?
Mr Johnson: That is right.

Q431 Chairman: So in one hit we could wipe out, if we had a big enough plant, the entire capital allowance scheme that you are proposing. Is that correct?
Mr Johnson: You would use up your capital allowances in that first year.

Q432 Chairman: No, you would use them up because you have cash constrained this, have you not?
Mr Johnson: Sorry; I do not think I fully understand your question.

Q433 Chairman: You put down the Exchequer cost in year one as £25 million, and if it is 100% write-off of an expenditure of capital against profit, am I right in saying that effectively you believe that you will relieve £75 million worth of potential investment? Is that what you are looking at?
Mr Johnson: I think it is a little bit more complex than that because what these numbers do is represent the additional cost to the Exchequer, so in order to work that out you have to calculate what you would have incurred anyway under the current allowances scheme of 25% and the 25 that you see in 2007–08 represents the additional cost.

Q434 Chairman: So in other words it is not 100%; it is a 75% add-on?

[5] Enhanced Capital Allowance

Mr Johnson: Exactly; that is right.

Q435 Chairman: But it amounts to 100% write-off for the taxpayer?
Mr Johnson: Yes, which means that the Exchequer takes a hit, as it were, which is represented here in this year.

Q436 Chairman: You can see what I am driving at; I do not want to detain the Committee any longer on this, but it would actually be quite helpful to know what are the capital investment criteria that lie behind the numbers in this table because, clearly, if what you are saying is that you have got some good feedback from the Budget and that there are projects coming along, then rather rapidly they should have some visibility. If you believe that this table is a fair representation of what you think you are going to be in for, I am intrigued to know how you calculated these numbers. Where did they come from?
Mr Johnson: They came from a series of discussions and submissions that we had from prospective investors, companies, over a period of nine months or a year, so they are material from companies based on companies' plans. I should stress that they represent cautious assumptions on our part. What that means is that they are at the upper end of the scale. This represents the expenditure that would be there if all the planned plant went ahead. To answer your question, they are based on the material that we have had from the kinds of companies that you have heard about over the sessions.

Q437 Chairman: I think we would find it very interesting because I am quite certain the Committee in future will want to track the progress to understand what the capital investment sums are which are in there. I presume that the normal rollover relief applies in terms of these allowances, does it?
Mr Johnson: I have to say I do not know. They work in the usual way. There is nothing particularly special about this other than that it is 100% allowance rather than 25%.

Q438 Chairman: But that is only relevant if you are making any profit.
Mr Johnson: That is correct, but there are various ways that companies can—

Q439 Chairman: At least that is where the rollover relief part comes in, so that is why I was asking that question. You are hoping that it is best practice. Have any of the people who have indicated that they would wish to invest in this area indicated that the Fischer-Tropsch method is one that they wish to invest in?
Mr Johnson: No, they have not on that specific route, but on the other advanced process which we refer to in the qualifying criteria, Losonoco, whom you may be aware of, do plan plant which will use cellulose to ethanol acid hydrolysis, I think, so that is one advanced process which one company has firm plans to use.

Chairman: Lynne, did you want to follow up on that?

Q440 Lynne Jones: I would be interested to know about this acid hydrolysis process. I have not heard about that one. I have heard about the enzymatic process and catalysis.
Mr Johnson: I will do my best. My understanding of this type of advanced process is that rather than take the starch or sugar and turn that into ethanol through fermentation, you use the woody material, the cellulose.

Q441 Lynne Jones: You digest the cellulose.
Mr Johnson: My understanding is that you can use enzymes to do that which are organic or you can use some kind of chemical process. My understanding is that they intend to use some kind of chemical process and their feed stock I think would be waste material rather than, say, straw.

Q442 Lynne Jones: The acid hydrolysis is not a process that we have heard about so we wanted to know about it. We have heard about cellulosic and Fischer-Tropsch but not acid hydrolysis.
Mr Johnson: Perhaps again I can give you a note on that.[6]
Chairman: That would be very helpful.

Q443 Lynne Jones: Based on the capital allowance expenditure, if you achieve the 5% target for biofuels, what proportion of that material is going to be manufactured in the UK?
Mr Johnson: I think it will depend on market conditions. I think our assumption would be that the UK share might be of the order of 50 to 60%, something in that region.

Q444 Lynne Jones: That is manufacture as opposed to the raw materials?
Mr Johnson: I think so, yes. We would expect some imports.

Q445 Lynne Jones: And what proportion of that would be on second generation biofuels?
Mr Johnson: I think if we are talking about 2010 we would assume a small proportion. I think Losonoco are the one company we are aware of which has firm plans which would impact at the 2010 timescale, but you have companies like Iogen in Canada which are using enzyme hydrolysis. They are looking to build a plant in the EU somewhere and there are other companies with interests in this, but if you are thinking about 2010 I think it would be fairly small and it would be Losonoco.

Q446 Lynne Jones: And you have told us how the RTFO is a central plank of policy because it is designed to encourage biofuels which are necessary as part of the climate change programme to reduce CO_2 emissions. That is right, is it not?

Mr Johnson: Yes.

Q447 Lynne Jones: So what carbon benefits do there have to be for a biofuel to actually qualify for both the derogation and for being included in the RTFO?
Mr Johnson: There are two separate answers. The ECA scheme is designed to reward the cleanest—

Q448 Lynne Jones: Which scheme?
Mr Johnson: The Enhanced Capital Allowances or the ECA scheme.

Q449 Lynne Jones: I am not talking about that. I am talking about the 20p and the RTFO?
Mr Johnson: The 20p has no carbon requirement. The RTFO will not have a carbon balance requirement in the initial phase. However, from year one there will be a reporting requirement on companies. They will have to report the life-cycle carbon make-up of the fuel. If the Government's aim is to use the RTFO mechanism to reward better carbon fuels in the future then before we can do that we need a robust methodology, one on which we can base that system, and that is why it is a reporting requirement.

Q450 Lynne Jones: So you are giving fiscal incentives for a process which may be of very little betterment to the environment in terms of CO_2 emissions?
Mr Johnson: Our analysis suggests that typically the savings from biofuels would be around 50% compared to main road fuels.

Q451 Lynne Jones: Is that well-to-wheel?
Mr Johnson: That is on a life-cycle basis.

Q452 Lynne Jones: It would be interesting to see some of those figures because we had Shell here last week who said that many of the processes may result in as little as 20% or even zero savings from CO_2 emissions and they would still qualify for these incentives.
Mr Johnson: But I think the bulk of the biofuel that we sold last year, for example, came from Brazilian ethanol, which I think most people recognise has a very positive carbon balance. It is a developed industry over 30 years. They use the straw again as part of the process and Brazilian ethanol delivers typically 70 or 80% on that basis. I would say that is the majority of what we saw last year. So I think it is true to say, depending on the pathways, that there are biofuels that potentially do not give you the carbon savings that you would like but, I think, in terms of what has had been producing the differential, the Brazilian product—

Q453 Lynne Jones: So Brazil is going to be able to supply the whole of the EU, is it?
Mr Johnson: I think that that is a difficult question to answer. Going forward it is unlikely in the medium term that Brazil will be able to. Brazilian domestic demand has been on the increase due to the flexi-fuel vehicles.

[6] Ev 185, D.

Q454 Lynne Jones: And there is of course concern about sustainability of agricultural practices in Brazil?
Mr Johnson: And that is a concern that the Government has made very clear it shares as part of RTFO. That is another area where companies will have to report from day one of RTFO on the carbon but also on the sourcing and the sustainability of the fuels.

Q455 Chairman: Mr Perrins, is your Department going to provide any irrefutable benchmarking process for this assessment in terms of being able to give the kind of quantifiable assurance that Ms Jones has just been talking about in terms of well-to-wheel?
Mr Perrins: Yes, in terms of the well-to-wheel assessment of the carbon balances, there is assessment which is shared between all of our departments and which will be developed further as part of the development of the RTFO to ensure that we have a robust methodology for calculating the carbon balances on the life-cycle basis as you have described. On the wider environmental aspects of biofuels, which I think was also in your question, Chairman, the answer is absolutely yes, we would certainly intend to have by the time that the RTFO comes into place in 2008 the best achievable method of assessing and reporting and answering on environmental effects, which would include issues which have been mentioned on the risks involved in tropical countries, for example, if forest land is converted into agriculture. That is recognised very much as a potential serious risk to biofuel development around the world.

Q456 Chairman: I am a little bit worried that you are going to have to wait until 2008 before this assessment mechanism is in place. We have just been discussing the system of enhanced capital allowances which begins in the financial year 2007–08 so if anybody is applying for help I presume they have got to give the Treasury some plans during 2006–07. So how are you going to decide which is going to be the cleanest and best and most environmentally friendly process upon which to visit an ECA if there is potentially an 18-month to two-year delay in Defra in providing this irrefutable benchmarking operation?
Mr Johnson: The way the ECA scheme will work is that Defra will run the scheme. Defra will appoint an administrator and the administrator will have to certify plants who would like to apply for the ECA. Put simply, if you want to apply to get the ECA you have to go to the administrator and convince the administrator to give you the certificate you need to qualify. You would not have to do this necessarily in advance in the way that you have described.

Q457 Chairman: If you were going to invest the kind of money that potentially we are talking about, and you quite rightly used the word "certainty" in your responses to our questioning, you would want to be pretty certain that you were going to get your advance enhanced capital allowance before you set off spending your money?
Mr Johnson: I agree you would like as much certainty as possible.

Q458 Chairman: But it is the investor who wants the certainty. All I am saying on the basis of Mr Perrins's helpful response and timetable for the incurrence of expenditure there could potentially be a hiatus from an investor's point of view where he could not be absolutely certain to tick all the Defra boxes before your system clicks in.
Mr Perrins: Yes, Chairman, I would say that there is a range of environmental factors which we are discussing here. The Enhanced Capital Allowance scheme focuses on the production process. It is an investment incentive for the construction of manufacturing capacity within the UK of the most environmentally beneficial production methods and therefore covers the biofuel production process itself. The criteria for that scheme are envisaged as set out in the documentation which is now available. For example, a qualifying criterion would be the use of combined heat and power, which is an energy-efficient process for manufacturing biofuel. This is a different range of issues from some of the other factors of concern which have been raised, for example, on the effects on land use in tropical countries. The rules for the UK's capital allowance scheme will not go into the area of the sustainability of the raw material supply and it is particularly that area which does need to be worked out further. The Government readily recognises that further work is needed on working up a viable scheme for reporting on these wider environmental issues and potentially social issues as well, so this could cover the social effects on employment, for example, in countries exporting to the EU in the future. These issues are not particularly straightforward. For example, on the land use point, what would you count as a qualifying criterion? Would it be that you only use land which has already been used for agriculture for the last five years or 10 years or maybe 100 years? Or maybe you should have a rule that any land which in the past was primary forest land of high biodiversity value should not be converted to agriculture to qualify for these incentives which the UK is putting in place. Those are all extremely important issues. They are not straightforward although work is proceeding with expert consultants to expand this scheme.

Q459 David Taylor: Very briefly to Mr Johnson from the Treasury, I am sorry to ask a question which may have been raised but it is about the Enhanced Capital Allowance scheme. My analysis of it is that the amounts that it might produce, not in terms of biofuel but in terms of financial incentives, to those considering investment in biofuel production plants, are tiny. It is a bit tokenistic, is it not? Why was it even incorporated in the Budget?

Mr Johnson: I think the first point to make on that is that the RTFO, in combination with duties, is the fundamental driver of biofuels development. I think everyone has always been very clear on that.

Q460 David Taylor: I am talking about the ECA.
Mr Johnson: In terms of the ECA, I think what the stakeholder discussion process has told us is that people have said that this will be a useful additional measure of support. A number of companies—British Sugar is one and Losonoco is another—have given us that feedback, so I think it is an additional measure of support. It sends a very clear signal about the Government's desire to have not just any biofuels but the best and most carbon-friendly biofuels, and I think while we recognise that RTFO is the key thing, that this is an additional financial mechanism, particularly for smaller companies which struggle to access capital.

Q461 David Taylor: But the alterations to its cash flow resulting from ECA would be insignificant compared to the traditional writing off of these investments against capital allowances.
Mr Johnson: I can only repeat what I said in that we recognise that the RTFO is very much the key thing. Companies have said that while not of massive benefit, as you allude to, it would be of some additional help to them.
David Taylor: It is not only not a massive benefit, it is a tiny benefit. Thank you, Chairman.
Lynne Jones: Can I come back?
Chairman: I am just conscious of the fact that the Minister is outside and waiting for us.
Lynne Jones: I have not asked the question I was supposed to ask.
Chairman: Very briefly.

Q462 Lynne Jones: The figures that we have been given indicate that the carbon savings of transport fuels provided by biofuels is significantly greater than the carbon savings for biomass heating schemes. Why is that?
Mr Johnson: I am not sure. My guess is that the policy position on biomass for road transport biofuels because of the RTFO will deliver these very significant savings by 2010 based on 5% biofuels, and it may be that in the heating policy area there is not likely to be so much market penetration, but I would probably have to defer to Andrew on that one.

Q463 Lynne Jones: We know that biomass heating and biomass combined heat and power has the potential to save far more CO_2 per hectare of plantation, so why are you going hell for leather producing the RTFO which at best is going to produce second-best CO_2 savings because no matter how much capital allowance there is you have acknowledged that we are not getting anywhere near with most of our supply being from second generation biofuels? Why are you not putting more effort into biomass heat and combined heat and power?
Mr Perrins: I would say in some ways the RTFO is an easier target. It potentially allows a quick—

Q464 Lynne Jones: It looks good but actually it shows very poor performance in terms of the environment and CO_2 savings.
Mr Perrins: It has the potential advantage that it can be introduced relatively quickly. By definition, it is a measure which applies across the whole economy. All road transport will be obligated to comply with the RTFO rules. Biomass heating has different characteristics in the sense that there is not immediately available a similar uniform mechanism which could be applied in a relatively short timescale to lead to such a dramatic step change in market penetration. The measures that the Government has announced on biomass heating will certainly lead to both significant carbon savings and a significant increase in uptake of this technology. The assessments, and maybe you are quoting from the Climate Change Programme for example, are based on what the funding which has been allocated to the scheme can deliver on the timescale covered by that programme, which is—

Q465 Chairman: Ms Jones is referring to Table A on Page 3 of Defra's evidence to the Committee which shows a huge difference, for example, between biomass used in grid electricity generation and the savings of CO_2 for example from biofuels or from oilseed rape.[7] There is a factor of four in carbon dioxide emissions between the two in terms of savings. It is just colossal.
Mr Perrins: Yes, as I believe Ms Jones said, it is recognised that if you take the comparisons in terms of the given amount of land that you have available for use for either of these purposes, the consensus would be that using the land to produce biomass for energy generation, and in particular heat, is significantly better than using the same amount of land for biofuel. In assessing the overall impact of these policies, it is necessary, I would suggest, to consider the state of development, where we are currently with these technologies, the potential uptake and the results of using different types of policy mechanisms where, as I said, the RTFO in the transport sector will have, when it is introduced, an immediate and dramatic effect across the economy, which is not the case—

Q466 Lynne Jones: What do you call 'dramatic'?
Mr Perrins: The change from where we are currently on biofuels which, as Martin Johnson said, is less than half of 1% in the UK to 5% is arguably a dramatic increase.
Lynne Jones: 5% but then if your carbon savings are not particularly great it is not doing that much for climate change?
Chairman: I think we will have to conclude our discussions there because I am conscious that the Minister has been waiting for 20 minutes and I think that is a very good question you can put to the Minister. Gentlemen, can I thank you most sincerely

[7] Ev 153, Table A

for your help and Mr Johnson for your agreement to supply to the Committee with some further information. Mr Perrins, the same offer is always open to anybody who comes before the Committee. If there is anything else you think we ought to know about that we do not, we are always very happy to hear from you. Thank you both for coming and giving evidence.

Witness: **Ian Pearson,** a Member of the House, Minister of State, Department for Environment, Food and Rural Affairs, gave evidence.

Chairman: Minister, may I first welcome you to the Committee, your first appearance before us after your change in office from being in the Foreign Office and DTI and may I thank you so soon after you have been appointed for volunteering to come and take Elliot Morley's place to come and talk to us about your Department's policies in the field of bioenergy. I think, however, it would be remiss of me if I did not put on record on behalf of the Committee our sincere thanks to Elliot Morley, who not only on this subject but on so many others was not only a willing witness but also a very useful contributor to so many of our inquiries. I think we will miss him but we look forward to our dealings with you.
David Taylor: That will go on record, Chairman, but will it also be a formal letter from the Committee because it is really important?

Q467 Chairman: I am sure the Committee would wish to express that but I wanted to get it on the record today because I think sometimes with the passage of personalities and things in government it is easy to forget, and sometimes it is important to say thank you when people have been singularly helpful to us.
Ian Pearson: Chairman, could I also acknowledge the enormous contribution that my predecessor Elliot Morley made to the field of climate change and the environment. I think it is important that I also put on record the Government's thanks for the work that he has done during the time that he was Climate Change and Environment Minister.

Q468 Chairman: Good, at least we start from a point of accord! We have had some very helpful discussions just before you came in with Mr Johnson from the Treasury and one of your own officials Mr Perrins so we have explored some of the issues surrounding the technical background to the subject that we would like to talk to you about. As you will also be aware, in preparing for a series of inquiries into issues affecting climate change the Committee has been both to the United States and to China and we are attempting now in the inquiry that we are now undertaking in bioenergy to bring some of the lessons together from those experiences. One thing that would just be helpful to know for the record is which department is actually in charge of strategy as far as bioenergy and biofuels is concerned?
Ian Pearson: There are a number of departments that have a clear interest in biofuels and bioenergy and it will depend on the subject area as to which department takes the lead. However, there is co-ordination of Government policy through the Sustainable Energy Policy Network and that is a body that helps to co-ordinate our overall response.

Q469 Chairman: But for example we have just been discussing questions of the duty derogation that is available on biofuels and also the level of enhanced capital allowances which are available. Defra on the one hand has policy responsibility for the climate change agenda. It also has policy responsibility for showing commitment and enthusiasm for biofuels and biomass from the agricultural standpoint. Who is the adjudicator when there is a difference of opinion between the two partners in trying to determine the way policy moves forward?
Ian Pearson: I think the other thing to stress is that we have a Cabinet committee which looks at these issues as well.

Q470 Chairman: Which one is that?
Ian Pearson: The Committee is called EE[8] and there is a sub-committee of that called EE(SD)[9], which is the sustainable development part of it.

Q471 Chairman: Who chairs that?
Ian Pearson: That was chaired by Elliot Morley.

Q472 Chairman: And are the Treasury members of that?
Ian Pearson: Officials will correct me if I am wrong.

Q473 Chairman: If you want them to come and sit next to you, they are very welcome to come back and be there because it saves you having to turn round all the time. You will get a crick in your neck!
Ian Pearson: I am sure they have already had a good innings.

Q474 Chairman: What I am interested in is, for example, if Defra took the view that more help needed to be given of a financial nature in supporting the industry and the Treasury disagreed, who is the ref?
Ian Pearson: We have to argue our case within government. There are a number of areas where Defra has policy lead responsibility where it does not have direct control over policy and that is as you would expect in dealing with a big issue such as climate change that covers a wide variety of government departments. The key thing is that as a

[8] Ministerial Committee on Energy and the Environment (EE).
[9] Sub-committee on Sustainable Development in Government (EE(SD))

Government we act corporately and that we pull things together. Ministers meet, officials meet, and policy gets thrashed out as a result of that process.

Q475 Chairman: Let us look at why your Department is supporting the field of bioenergy. Would you like to tell us in your judgment in rank order what are the reasons why you are supporting it?
Ian Pearson: We believe that bioenergy is good for the environment and good for energy security. Our main policy driver is to stress the environmental benefits in terms of reduced CO_2 emissions and contribution to our overall targets, but there are additional policy objectives as well, and clearly in the Energy Review which is taking place at the moment renewables is a key part of that and renewables is an important element in the overall energy mix as regards security of energy supply for the UK.

Q476 Chairman: In your written evidence you indicate that between five and 6% of the UK's electricity supply could be from biosources by 2020; 7% of the heat market by 2015; and 5% of the UK's transport fuel demands by 2010. Are you confident that all three of those goals can be met?
Ian Pearson: Those are certainly goals. The DTI Renewables Innovation Review concluded that 6% of energy could come from biomass by 2020. As you will understand, we are at very low levels at the moment but the market is growing. When it comes to biofuels, again we are starting from a very low base but there is every reason to believe that the market is growing strongly and there are a number of significant investments which will be coming on-stream shortly that will enable us to make sure that when it comes to the RTFO that that policy can be implemented successfully. As you will appreciate, in the Budget the Chancellor announced the progress that he wants to see taking place from April 2008 through to 2010 when the full 5% target will be achieved.

Q477 Chairman: Do you want UK sources of the biomaterials that are relevant to the targets that I have just mentioned to come from within the United Kingdom?
Ian Pearson: Yes we do, but I do not think it would be right to say that we want 100% to come from the UK. I think that that will depend on the market. Certainly it is Government policy to encourage domestic supply, and I think there are some obvious reasons why that should be the case.

Q478 Chairman: Let us just probe a bit in terms of what indigenous supply there is. As far as your Department were concerned, a year ago on 16 March when I tabled a parliamentary question Elliot Morley told me that the only bioethanol plant that was currently going up in this country was the British Sugar one which was proposed to produce 55,000 tonnes of bioethanol a year. What has changed in the last 12 months?
Ian Pearson: My understanding is that sales of biodiesel and bioethanol were five times higher in 2005 than they were in 2004. As I say, that is still coming off a low base but the figures that I have—

Q479 Chairman: But Minister, that was not the question I asked.
Ian Pearson: I am coming on to answer the question. I said the figures I have to hand say is that in 2005 the market was around 33 million litres of biodiesel and 85 million litres of bioethanol. There is a new plant in Scotland which will produce 50 million litres of biodiesel a year from animal fats and used cooking oil. A new plant on Teesside is under construction which is going to produce up to 250 million litres of biodiesel a year from oilseed rape and other vegetable oils and a plant that is being built in Norfolk will produce 70 million litres of bioethanol per year from sugar beet. It is my understanding that various other plants are at the planning stage so there is a lot of activity that is going on that has, I believe, been directly stimulated by the tax breaks offered by the Treasury and also the impending introduction of the obligation.

Q480 Chairman: So we have still not got a great deal different from what you answered a year ago in terms of actual production. I added it up and in the biodiesel field it comes to roughly about half we would expect from UK sources and we are miles off in terms of bioethanol. You said that one of the reasons for having this policy was to do with energy security and in the case of petroleum replacement we do not seem to be getting anywhere near that. Is that satisfactory?
Ian Pearson: I do not accept that as an assessment. Certainly the key driver is climate change and wanting to tackle climate change. A subsidiary policy driver is the fact that renewable energy is good for the security of supply. If you add up bioethanol and biodiesel and if you say that the market in 2005 was 114 million litres, then the new plants that I just mentioned will produce an extra 370 million litres, so that is more than treble, and that is just from those current known plants that I mentioned. I am certainly very optimistic indeed that various other plants that are at the planning stage will receive planning approval and go through and that the market in this area will build very strongly. I would certainly like to see a high domestic proportion of biofuels as part of the overall obligation.
Chairman: Mr Taylor, on the same point?

Q481 David Taylor: On the very same point, Chairman. A very brief observation from the figures that the Minister has quoted, in fact for this year I believe from our papers here it is something like 150 million litres of biofuels in a national consumption of 60,000,000 litres of fuel, which is one quarter of 1% at the moment. I am not trying to rubbish it but we are at an extraordinarily low base, are we not?
Ian Pearson: We certainly are and I certainly accept those figures. It is about one quarter of 1% and certainly the obligation says that we are going to get to 5% by 2010. What I think is important to

recognise is how quickly the market can change in this area. We are already seeing the plants I mentioned in the process of coming on-stream and I do think that the combination of this early incentive in terms of the tax breaks from the Treasury and the obligation starting to come in from 2008–09 is really going to drive the market and the market is going to deliver in this area. I am not saying that all of it is going to come from the UK. Some of it probably will be imported, but I think it is clear that there is a market building in the UK, contracts are being signed with producers at the moment for oilseed rape and other energy crops, and obviously we will closely monitor developments as a Department, but I think there is every reason to be optimistic that we have got a growing market here.

Chairman: It would be helpful to us if you could update us with as much accurate information as you can on the answer that I got on 16 March and if you would be kind enough to convert it into something common because your parliamentary answer talked in terms of tonnes and your response to the Committee has been in terms of litres. It would be quite nice if we could find some common nomenclature to describe it so that we could look, as Mr Taylor has done, at the proportions. I am going to come back to some of the things that you have mentioned but Mr Vara would like to ask you some questions further about the Road Transport Fuels Obligation.

Q482 Mr Vara: Thank you, Chairman, and welcome, Minister. As the Chairman says, if I can just continue that theme, Defra has said in the past that the UK has the land capacity to supply 5% of road fuels today and it is felt by 2050 the UK could produce as much as one-third of its transport energy needs from biomass. You have been very optimistic in your comments but if I can turn to being realistic: in your opinion how realistic is it that we will be able to meet the 5% target by 2010?

Ian Pearson: I believe that the five per target for biofuels is a realistic target. As has been mentioned, we are currently at one quarter of 1% so the market will have to get a move on between now and 2010. I believe that it is a realistic target and, as I indicated, I think there is a strongly growing market out there that is going to deliver. Obviously when it comes to the obligation it will be up to companies to comply with that obligation and we hope that they will find it in their interests to source a lot of that obligation from UK domestic companies. We cannot and it would not be right to guarantee a particular percentage that has to come from UK sources.

Q483 Mr Vara: How much capacity of UK land should be used to meet that 5% target?

Ian Pearson: UK arable land is round about five million hectares, of which half a million is classified as set-aside and industrial crops such as biomass could be grown on set-aside land. The Biomass Task Force suggested that about one million hectares could in the future be devoted to all industrial crops, so that would be energy crops as well as biofuel crops and other crops for industrial use as well. If you look at that figure, certainly in our view it would be a plausible figure that could be devoted to what is a new opportunity for the farming sector.

Q484 Mr Vara: The subject at hand is obviously medium to long term and whilst I appreciate the target is 2010, to what extent are any preparations being made at the moment to ensure that post 2010 we are heading for the target of one-third of transport energy coming from biomass in 2050, or is that something that is going to be sorted in 2010?

Ian Pearson: I think the figures quoted in the memorandum about one-third by 2050 were actually—and I will have to check this with officials because I must admit I looked at it and thought, "Um, this seems rather on the high side"—is based on results from a report *Liquid Biofuels and Renewable Hydrogen to 2050—An assessment of the implications of achieving ultra-low carbon road transport*, which is a document published by the Department for Transport in July 2004. That is the technical basis for the figure quoted of one-third of transport energy needs from biomass but that is just a study; it is not a Government commitment.

Q485 Chairman: It is set down here in the evidence you gave to the Committee as a Department. If you did not accept it, why did you submit it?

Ian Pearson: I was not actually the Minister responsible at the time here.

Q486 Chairman: Whoever wrote this—

Ian Pearson: Can we be clear what we put in the memorandum. We said: "With advances in technology, it is estimated that by 2050 the UK could produce as much as one-third of its transport energy needs from biomass." That is not a policy commitment, is it? It is saying we could.

Q487 Chairman: I am not saying it was but you yourself—

Ian Pearson:—I think you strongly hinted.

David Taylor: Is that an aspiration or a target?

Q488 Chairman: You yourself questioned the validity of the evidence because one of the things I was going to ask you was how was this trick to be pulled? What was actually going to happen? What were going to be the changes in land use that would see quite a significant change from 5% to $33\frac{1}{3}$%?

Ian Pearson: My understanding is that this is a study that looked at potential and it is clear from the evidence that we submitted that this is something that could be achieved.

Q489 Chairman: That is why I asked the question about who was in charge? You have got a situation where the Department for Transport in 2004 go off and produce a report and you as an incoming minister astutely look at this and say, "That seems to be quite a large number. I do not know whether I can potentially sign up to that; I will ask a question" (which is a very healthy start to your incumbency that you ask the question) but your Department receives this document from the Department for

Transport and they put this possibility into a piece of evidence which has got your Department's name on it. Therefore I ask the question: should it not have been ruled out in the first place? If it is not realistic, what right have the Department for Transport got to go writing policies about what is going to happen on the agricultural land of the United Kingdom?
Ian Pearson: I think we were trying to be helpful to the Committee in terms of indicating the potential in this area but what is clear to me is that we have our own targets when it comes to the RTFO and biofuels and we do want to see, when it comes to bioenergy crops, an increase in the percentage that comes from the UK.

Q490 Chairman: You said in your evidence that there is a "healthy marketplace" which is the phrase that you have used there.
Ian Pearson: For biofuels.

Q491 Chairman: Yes, and that you think that you will get to your 5% in 2010. Let me turn the numbers the other way round. That still leaves us in 2010 with 95% of fuels which are not of a bio variety. So are we not going to be stuck at that figure of 5%? Is that the ceiling? Is that the limit of the Government's ambitions? Because if it is not, what are you going to do to stimulate this to take advantage of biotechnology to help reduce greenhouse gas emissions in the two sectors in which it has been significantly rising during the Government's stewardship of policy for this area?
Ian Pearson: It is not the limit of the Government's ambitions.

Q492 Chairman: So what are the Government's ambitions?
Ian Pearson: The Chancellor said in his Budget statement that the Government intends that "the target should rise beyond 5% after 2010–11 so long as infrastructural requirements and fuel and vehicle standards allow, and subject to the costs being acceptable to the consumer."

Q493 Chairman: Where does the Chancellor's ambition lie? If by that, we are talking about the introduction of flexi-fuel vehicles, tell me how you see things moving? Where does the Chancellor's ambition lie for starters? Where does he think it can go to?
Ian Pearson: I think that is a question that you might want to direct to the Chancellor rather than to me.
Chairman: You are here.

Q494 Lynne Jones: You should be pressing him.
Ian Pearson: I have not taken the Chancellor's mind on this area.

Q495 Chairman: Let me relieve you of the difficulty to try and walk away from the question; will you as the Minister who is before the Committee in the Department that is responsible for this policy be kind enough to pose the question to the Treasury and get us an answer?
Ian Pearson: With respect, I have given you an answer. I have given you an answer that says that the Government intends that the target should rise beyond the 5%.

Q496 Chairman: But to where?
Ian Pearson: It intends that it should do that as long as infrastructural requirements and fuel and vehicle standards allow.

Q497 Chairman: But the Committee has heard evidence about the availability for example of bio flexi-fuel vehicles which do not require a significant change to the vehicle fueling infrastructure. The technology is proven. The technology as an example is available now. I am interested to know whether in the thinking that the Chancellor has had about the potential target or the potential opportunity for more biofuels to be used, when he looks at all of these existing pieces of technology, and things are obviously going to change up to 2010, where does he see this target going? What is the track? We seem to be able to produce targets for everything else. For example, in the Enhanced Capital Allowances document the Chancellor projects forward what he thinks he is going to be able to relieve. The document for example goes as far as 2012 so somebody is thinking about this as far as 2012. The target is 2010 for the Road Transport Fuels Obligation. What is going to happen in the next two years?
Ian Pearson: I appreciate that you might, Chairman, want to get me to try and set new targets.

Q498 Chairman: No, I am just asking will you go and ask the Chancellor what he means by that.
Ian Pearson: What is clear, again, is that we have already heard that at the moment we are at a quarter of 1% and that we have set a target for 2010 of 5%. We have said that we have an intention that we would look to proceed further. I do not think it is an unreasonable place to be as a Government. I think you run the risk of losing credibility if you are going to suggest that you are going to set targets for 2012, 2015 or 2020 in an area that is still developing and still under a state of evolution at the moment.

Q499 Chairman: But, with respect, the Government has set a 2050 carbon reduction target. I do not think it is unfair to ask what are the component elements as to how you are going to get there. If the Chancellor has made a statement that he thinks that something can go beyond present numbers, I do not think it is unreasonable for us to simply ask what does that mean because obviously the implications of that target are important in terms of UK agriculture land use, importation and some of the other issues that we are going to come on to. I appreciate that you cannot answer that question at the moment but I think we would like you as the representative of the department with policy responsibility to go back and ask the question what does it mean.
Ian Pearson: As I say, there are certain things that will need to be put in place if the target is going to go higher and I mentioned some of the infrastructural

requirements and, as I say, fuel and vehicle standards. Let me be blunt about this. I think personally that there is scope for us to go further after 2010. I would be very surprised if the Government decided that it did not want to do that. I do believe from my understanding of the technology that it would certainly be feasible to go further than that. I am just saying to you that at this moment I think it would be unwise to jump to have a longer term target when we have already got a stretching target of 5% by 2010 to achieve.

Q500 Mr Vara: Very briefly on that point, you say it is a bit premature at the moment to look beyond 2010 to see what happens then.
Ian Pearson: No I did not say that.

Q501 Mr Vara: That is what you more or less implied.
Ian Pearson: I did not say you have to see what happens then. I think you have to see what happens from now on and, as I say, I think the market is rapidly evolving. The RTFO is not even in yet. It does not come in until April 2008. We do not know whether there might be any teething problems or issues with its introduction. Clearly we will plan to make sure that there are not. I think there is an appropriate time to do these things and we all have to make judgments about policy. From reviewing where we are at the moment it seems to me to be not an unreasonable judgment to make to say we are introducing the RTFO, we are setting targets of 2.5% for 2008–09, 3.75% for 2009–10 and 5% for 2010–11 and the policy is not even in yet and implemented. Let us not push it too far too soon.

Q502 Mr Vara: Minister, I hear what you say. At this stage four years before 2010 the Government has been able to make a target of 5% in 2010. In 2009, let's say, will the Government be able, on the basis of the information and the evolution, to use your words, that is taking place as at 2009, to give a more firm answer as to how the projection is going to go beyond 2010? What I am basically driving at, Minister, is we have a projection of sorts between now and 2010, but at what time in the next four years will a further projection be made beyond 2010? I hope you will not say it has to be in 2010 because if you are capable of saying in advance that you know—
Ian Pearson: I am not saying it has to be in 2010 at all. I am just saying—

Q503 Mr Vara: Can you give an indication of when?
Ian Pearson: I am just trying to give you an indication that it would not be appropriate, in my view, to actually do it now in advance of introducing the obligation and seeing how the obligation works. If the market builds sufficiently this year and next year, then it could well be possible, given the related issues such as infrastructure that I have mentioned, that the target could be extended beyond 2010, but I think that the Committee is struggling on a relatively small issue here about whether we should make a decision to go further on something that has not been introduced yet at this point in time. We ought to have ambitions for increasing the target further.
Chairman: With respect, I do not think my Committee is struggling on the point. Mr Kawczynski?

Q504 Daniel Kawczynski: Thank you, Mr Chairman. I would like to welcome the Minister to his new position. I spent a couple of very pleasant days with him in Hong Kong during the World Trade Organisation talks when we were both representing our country there and I thought that he was a very able Minister. I very much hope that now that you have been appointed to this position you can use that passion and energy to promote this subject of biofuels, which I think has been very lacklustre to date by the Government, to be truthful. In your role will you be having discussions with your counterparts, in China for example and other leading nations, to encourage them to increase their production because, of course, you will know that no matter what we do in this country, if the Chinese do not follow suit we might as well be blowing in the wind.
Ian Pearson: Firstly, many thanks for the kind words. As Trade Minister, I visited Brazil which, as the Committee will be very well aware, pretty much leads the world when it comes to bioethanol. When you visit Brazil you do see the real potential that is there to produce renewable fuels. It is important that the UK Government continues to take a leading role when it comes to climate change and issues of energy efficiency, and renewables are part of that picture. Certainly my view very strongly is that we do need to be influencing China and India and other rapidly growing economies so that as they expand they expand in as green and as clean a way as possible. That is certainly a major part of the dialogue that we have with countries like China and India at the moment and will want to continue to have in the future.

Q505 Chairman: Minister, in paragraph 1.3 of your evidence you say: "'Second Generation' technologies can offer much higher carbon savings, potentially making them entirely carbon neutral." What is your Department doing to encourage the uptake of this technology?
Ian Pearson: It is my understanding that a lot of the second generation technology is not proven at the moment and that there are a number of research projects that are taking place. Some of them are supported at an EU level and some of them are funded and assisted through Defra and I believe other parts of the Government as well. It is an area where a lot of research has been going on, and like other areas of policy actually getting some of this out from the universities, commercialising it and marketing it and driving the costs down are going to be important issues for the future.

Q506 Chairman: But I am sure you will have been briefed about the Shell/Iogen relationship and the project in Canada and that company's wish to

develop a plant like that in Europe and the fact that the German's are spending some €500 million encouraging research in this area. If there is that degree of commitment I ask my question again: what are we doing? If I turn to Table A on Page 3 of your Department's evidence, there is some pretty interesting material there which talks about the degree of CO_2 savings depending on the type of production of biofuel that you use. Why then are you concentrating so hard on first generation when the second generation of biofuels and possibly the plant and the bio refinery offers some quite remarkable steps forward in technology which has been proven, as witnessed by the Shell and Iogen investment in Canada?
Ian Pearson: I do not think it is a question of either/or but clearly we want to use the best proven technology possible that produces the maximum benefits. The DTI technology programme is supporting research on second generation biofuels and the recent call for projects under the £15 million Energies Technology programme includes R&D on next generation industrial biofuels, so there is work being funded by Government in this area.

Q507 Lynne Jones: £15 million is not much compared to €500 million, is it?
Ian Pearson: I cannot deny your mathematics.
Lynne Jones: And only a bit of it goes to this area.

Q508 Chairman: What about the fact that the Treasury have just launched the Enhanced Capital Allowances scheme, although not in the list that you helpfully read out a moment ago, trying to encourage the best techniques of biofuel production both of the first and indeed the second generation? You have seen the numbers on the Enhanced Capital Allowances model. Has your Department done any work about uptake of that in terms of encouraging second generation?
Ian Pearson: My understanding of Enhanced Capital Allowances is that Enhanced Capital Allowances are not yet in existence.

Q509 Chairman: Could I direct your attention then to the Budget 2006 Red Book, paragraph 7.69, which provides a description of the scheme and says: "The Government has now applied for state aids clearance and, subject to that, envisages the scheme being in place as early as 2007."
Ian Pearson: Exactly so it is not existence yet.

Q510 Chairman: No, but the terms of it are and they are obviously going to be looking at the effect in terms of affecting people's investment decisions. The numbers that have gone in there must be informed by something. I just wondered what input your Department had had in terms of deciding the amounts of money that were going to be put in hopefully to encourage second generation projects in terms of bioenergy?
Ian Pearson: I am not sure that you necessarily understand how the Enhanced Capital Allowances—that is probably unfair because I am sure you do understand how the Enhanced Capital Allowances regime works but I am not sure that from your question you necessarily have demonstrated that. Certainly my understanding is that the figures in the Budget document will assume a certain take-up of capital allowances.

Q511 Chairman: Minister, it is in the Budget document. I am not talking about that. I am talking about the Regulatory Impact Assessment that was published on 5 December last year on this particular matter. I was interested to know what input Defra had had in helping the Treasury to determine the level at which this Enhanced Capital Allowances scheme was to operate. You must have some idea as a Department what work is going on in these various areas against the criteria set for qualification for these allowances. What input did you have?
Ian Pearson: I am sure that discussions took place between officials in Defra and the Treasury when looking at the Regulatory Impact Assessment and I have got no doubt that officials will confirm that. My difficulty in your question is that you seem to be thinking that this is a budget or a pot of money that companies bid into; it is not, it does not operate like that. My understanding of the capital allowances regime is that it will allow the cost of investment to be written off for tax purposes at a rate of 100% in the first year of incurring the capital expenditure and it will be up to companies in the marketplace to decide how many of them want to take advantage of that because they are making the relevant qualifying capital investments. Our best estimates will undoubtedly be there in the Regulatory Impact Assessment for you to study. We do not know what the actual take-up will be of the regime and, as I say, the regime is not actually in existence yet.

Q512 Chairman: That is not quite what the official from the Treasury who was here earlier told us. He told us that the numbers had been decided as a result of discussions with companies who wished to make investments in this area, so I was interested to know whether you could tell us a bit about the kind of project work, who might be interested, what kind of work was going on in this area?
Ian Pearson: I think that is a question that you can direct at officials who will have been involved in discussions.

Q513 Chairman: I am directing it at you, Minister because you told us earlier that your Department was in the driving seat of this and it is quite evident—
Ian Pearson: I did not tell you that my Department was in the driving seat when it comes to the Enhanced Capital Allowances regime.

Q514 Chairman: But you must have had some input into it because you told us earlier you had dialogue with other departments when you were sorting out policy in this area.
Ian Pearson: I have got no doubt that officials will have discussed details of this regime.

Q515 Chairman: I think what we are trying to get at is is there actually going to be a second generation biofuels market or manufacturing capability developed in the United Kingdom? The reason why Ms Jones asked the question about the level of grant or the level of allowance or investment in comparing the United Kingdom with Germany is were we actually putting enough resource into developing the technique which in terms of biofuel has the greatest potential to save carbon dioxide emissions compared with the first generation techniques?
Ian Pearson: Can we be clear that this is not a government grant and this is not government investment.

Q516 Chairman: I appreciate that.
Ian Pearson: This is a government allowance that enables a company that makes a qualifying investment to write it off against tax in the first year.

Q517 Chairman: However you like to put it, it is a cost to the taxpayer, whether you have it as tax foregone, which is what an allowance effectively is—
Ian Pearson: I accept that, yes.

Q518 Chairman: We are asking you a very simple question, we are not trying to trip anybody up, we are just trying to establish whether this is a sufficient level of inducement to encourage the next generation. I was hoping that you might be able to give us some examples of the types of project that might be on the horizon that have clearly informed the level of allowance which is in this Regulatory Impact Assessment. The Treasury told us there is something underneath it. I was hoping you might be able to flesh it out a bit for us.
Ian Pearson: The Enhanced Capital Allowances regime is principally a matter for the Treasury. Clearly there has been input from Defra into the decision-making process but we would not be introducing an Enhanced Capital Allowances regime if we did not believe it was going to provide the right sort of incentive to bring forward capital investment in this area.

Q519 Chairman: So what discussions have your Department had with people who might be giving you some indication of what is in the 'forthcoming attractions' column?
Ian Pearson: I am quite happy to write to the Committee if that would be helpful.
Chairman: It would be very helpful indeed and you might like to confirm whether normal rollover relief provisions also apply to the capital allowances here. Lynne?

Q520 Lynne Jones: You said a little earlier, Minister, that Brazil leads the world on biofuels. Have you got any analysis of why that is and whether there are any lessons to be learned?
Ian Pearson: I do not have any analysis to hand, but certainly one of the reasons that Brazil is one of the world leaders—and I would not necessarily say it is definitely the world leader—is that it has had government commitment to this policy area and it has been very efficient in terms of being able to use principally sugar cane, from my understanding, and being able to convert it into ethanol. If you catch a bus in Brazil, it will be run on bioethanol. If you look at their cars, most of them will be run on bioethanol. It is impressive and I think that we do have lessons to learn from Brazil and what Brazil has done.

Q521 Lynne Jones: You might like to look at that because the caveats in relation to some of the schemes that you were mentioning about subject to acceptability of the markets and the infrastructure being in place, subject to this, that and the other, maybe the Brazilian Government was a bit more determined and did not have so many caveats but—
Ian Pearson:—Maybe it is starting from a different position as well.

Q522 Lynne Jones: On a different tack, one of the problems with Brazilian bioethanol is that it is not as good as it could be in terms of the potential carbon savings. The table that you gave us showed that it had about 40 to 50% of the CO_2 emissions of conventional fuel, and that does not take into account other problems in relation to the sustainability of production, which really brings me on to the need for carbon assurance schemes. How far are we away from having a carbon assurance scheme on the production of biofuels and how important is it to your Department?
Ian Pearson: It is important to our Department and we believe that obligated companies under the RTFO will be required to report on the level of the carbon saving achieved from biofuel and on other aspects of sustainability. We have said also that this aspect of the RTFO will be reviewed with the possibility of making these criteria mandatory, but we have not committed to doing that yet.

Q523 Lynne Jones: We heard earlier that it is irrelevant what the carbon savings are in terms of whether biofuels will qualify for the 20p derogation and the RTFO, and that causes us considerable concern because you said that you do not think it is a question of either/or in terms of first generation or second generation biofuels. I do not know whether you had any feedback from our meeting with Shell last week and the evidence we got from them, but they were very concerned that the current policy could lock out second generation fuels because we are willing to accept as qualifying fuels those which actually have very poor performance in terms of reducing greenhouse gas emissions.
Ian Pearson: I think you are very right to highlight this as an issue. You make a very good point about this. It is a policy question that we will need to look at as a Government.

Q524 Lynne Jones: I was suggesting that it was very urgent. We were talking earlier about production of biofuels from set-aside land and also from surplus production, but we had evidence that to get to the 5% renewable obligation we would require all of that land mass in terms of current technologies, which does not actually leave us very much for other areas

where we should be considering crops that could help us in climate change generally such as biomass. Biomass has far more potential for carbon savings in terms of land use. Are some of the priorities not somewhat inappropriate in terms of this? If the driving force behind this is climate change, should your Department not be doing more in terms of carbon accreditation and having the information available to ensure that we use efficiently what land mass we have available and what support that we are giving in terms of financial support? You are nodding—so what are you going to do about it?
Ian Pearson: I am nodding because I think you are making a number of very important and sensible points. The primary purpose of what we are trying to achieve in terms of promoting biofuel is to reduce carbon emissions, so clearly we want to ensure that we achieve the optimal environmental outcomes. That is why I said that we would certainly be prepared to review this particular aspect of the RTFO because we do not want to be in a situation whereby we are not achieving the optimal carbon outcomes that we are seeking.

Q525 Lynne Jones: Should this not have been thought about before going down the route of the RTFO? Should not some work have been done on the carbon accreditation scheme because you are encouraging farmers and you are encouraging land use for biofuels and to a lesser extent encouraging biomass crops for energy and heat?
Ian Pearson: As you will see from the evidence, we are providing encouragement for both biofuels and for biocrops as well. I certainly do not see this as an either/or situation.

Q526 Lynne Jones: It is if you have got a limited amount of land and it is crucial that it is optimised for CO_2 emissions.
Ian Pearson: If you just look at things purely in a UK context then that might well be true, but certainly I do not think that anybody is suggesting that all our biofuel obligation will be met purely by UK domestic production.
Lynne Jones: It certainly will not and carbon accredited schemes are essential for imported fuels as well.

Q527 Chairman: Can I follow that on by directing you to your own evidence because in paragraph 4.5 you say: "As part of the Renewable Transport Fuels Obligation, the Government proposes to develop carbon and sustainability assurance schemes. The schemes would apply to fuels sourced in the UK, wider EU and at the international level." Where are we with that work?
Ian Pearson: My understanding is that that work is very much going on at the moment.

Q528 Chairman: That is a great statement, Minister, but, for example, in paragraph 4.4 of the same evidence you say here: "The Home-Grown Cereals Authority is setting up a carbon accreditation scheme for bioethanol from wheat and sugar beet." I think the worry is that you are going to have different standards being set by different people. Can you tell us when the work on the assurance scheme mentioned in paragraph 4.5 is likely to see the light of day? I know it is continuing. It may be that you have not yet been advised of that but could you find out for us?
Ian Pearson: I have not been advised of it yet but I am more than happy to discuss that with officials and get back to you.
Chairman: Thank you. Also it would be very helpful to know what kind of things are going to be looked at because it is alright talking about well-to-wheel assurance schemes but we have not seen the guts of what one of these things look like, bearing in mind some of the wider issues to which I think your official referred to earlier before you came in when we were talking about biodiversity issues, and I hope I do not misquote him, particularly when it comes to imported fuels, because clearly in terms of UK agricultural land usage there are environmental requirements already built into the system, so it would be helpful to have a little more information on that. Lynne, did you want to go back to the question you had?

Q529 Lynne Jones: I was going to ask about the Cereals Authority scheme but I think it is very important as well that we have a scheme for environmentally friendly techniques and it should apply to overseas production as well as British production and we need to know how you are going to do that.
Ian Pearson: Let me try and provide some more information to the Committee on this particular area. I would want to stress that the Government is concerned about the risk of inappropriate development of biofuels which could, for example, add to rainforest destruction and could lead to incentives so that in some of the least developed countries they do not produce the food that they want because they are producing biocrops for export. It is an area that we do need to look at and we would be concerned if that were happening. We are happy to write to the Committee about that.

Q530 Mr Drew: When we went to Brazil as a select committee—and welcome Minister by the way—I think we were impressed by the commitment of the Brazilian Government (and you have been there more recently). They set strong physical incentives to both the car manufacturers, ie, they told them what they had to do, and they then provided the bioethanol. Okay, we have not got bioethanol to the same extent but surely there is a message there that unless you have a physical set of measures, you can have all the fiscal incentives under the sun but you have got to kick-start this, you have got to tell somebody what to do. Why is this Government so unwilling to recognise that climate change is not going to be faced up to unless we actually tell some people what their commitment should be?
Ian Pearson: I do believe that the Government is facing up to the issue of climate change. The UK has taken a leading role internationally on climate change. Last year during our G8 Presidency, we

made climate change (along with Africa) a top priority and it remains of fundamental importance to the UK Government that we continue to lead by example domestically and to push internationally on the climate change agenda. So we are certainly doing that and we think that what we are putting in place with the Renewable Transport Fuels Obligation, with the tax break that is already in place, is kick-starting the—

Q531 Mr Drew: —But they are all fiscal.
Ian Pearson: They are all fiscal incentives.

Q532 Mr Drew: You have got to tell somebody like the manufacturers that they have got to provide vehicles that are dual fuel and that that dual fuel will gradually move from fossil fuel to bioenergy. Tell them. The Brazilian Government told them and now they flock there—and we saw the cars being made—to make their cars because they have built up that expertise. We do not build cars, sadly, not to the extent we should be anyway, but we could be telling the parts of the world that do build cars that is what we expect in terms of the importation of cars.
Ian Pearson: Firstly, we build 1.6 million cars a year in the United Kingdom, which is probably more than we have done at any other point in the UK's history. We are also home to 19 of the world's top 20 component manufacturers.

Q533 Mr Drew: So why are we not telling them what they have to do?
Ian Pearson: And we have a successful, vibrant UK industry even though we have had recent announcements like Peugeot.

Q534 Mr Drew: So why are we fearful of actually giving some clear instructions of where we expect the world to go?
Ian Pearson: I think the days of the Government directing the car industry have perhaps gone. What we do believe—

Q535 Lynne Jones: You can set regulation in terms of requirements. It is done not just in Brazil, it is done in California.
Ian Pearson: At the UK and at EU level there have been regulations set in terms of emissions. There is no doubt about that. What we do believe, though, is that with the measures that we have put in place through the Renewable Transport Fuels Obligation as a key measure, but also through the duty tax break that is on offer and through the Enhanced Capital Allowances regime, we have got a range of measures there that will work with the market and we believe deliver the policy objectives that we want to see. I would be very interested to hear the Committee's view when it reports on the Brazilian experience and its views about whether we can sensibly be doing more in this area. As a Government we do have an open mind. I would like to believe that government officials and government ministers have thought through this and come to a considered policy view, but if there is compelling new evidence that suggests there is more we should be doing in particular areas then we are very happy to consider that.

Q536 Mr Drew: Why do we not move the Government's stock of cars over to being largely bioenergy? They have done that in terms of LPG and compressed natural gas some years ago, certainly for ministers' cars. Why can we not just make a revolutionary statement saying that in two years' time the whole stock will go over to biofuel and bioenergy like Somerset? Why can we not do that?
Ian Pearson: We are certainly looking at the moment at sustainable procurement, not just in the narrow sense to which you are specifically referring, but in a broader process as a Government. We think that sustainable procurement is an area where we can do a lot more as a Government, not just in government procurement but also local government procurement as well.

Q537 Chairman: It is interesting that the briefing that the Global Bioenergy Partnership put out at Gleneagles was that "G8 leaders would be travelling in cars powered through a blend of ethanol derived from biomass." I wonder what happened to those cars. Could it be the little bit of pump-priming that you are needing for your initiative? Do you think the Global Bioenergy Partnership has the ability or is the forum to establish some kind of international agreement on the kind of benchmarking exercise in terms of the well-to-wheel carbon dioxide savings that we have been discussing?
Ian Pearson: I think it is very early days for the Global Bioenergy Partnership but certainly I am optimistic that it can be an important forum for a wide range of discussions about—

Q538 Chairman: Is it on its agenda?
Ian Pearson: My understanding is that its first meeting is actually tomorrow.

Q539 Chairman: That is funny, I have got a round table minute here for a meeting that occurred on 9 December 2005 between the hours of 1 pm and 3 pm in EU Pavilion Room One where a vast array of people connected with this all met and discussed what they were going to do. Maybe that was just the round table meeting to set up the thing but perhaps you can find out whether they are going to discuss this for us. That would be very helpful. Now we are going to move on to biomass.
Ian Pearson: My officials tell me that the formal launch is tomorrow.
Chairman: The formal launch? I wonder what all these people were doing in December. It is up on their web site. It was a meeting convened by the Italian Ministry for the Environment and Territory. So there we are. You can have a look at it if you like and see what they were up to. Daniel?

Q540 Daniel Kawczynski: Minister, you acknowledge that the contribution from biomass can be very insignificant yet the Renewable Transport Fuels Obligation is predicted to save 16

times more carbon than the new subsidy for biomass heat. Are you fully exploiting the potential of biomass? Just as an aside, I would like to tell you that I recently visited a company in my constituency that was importing burners that were working on biomass and they were starting to sell them to facilities throughout Shropshire. They were big enough to power whole theatres, swimming pools and leisure centres. Basically these people were telling me that the Government could be doing far more at the moment to be promoting this sort of technology. It would be interesting to hear your views on that.
Ian Pearson: I recognise the figures that you quote I recognise because they come from the Climate Change Review and I think you are right to suggest that we can be doing a lot more when it comes to biomass. Again, it is an area where I do expect to see significant future development. It is one of the reasons why the Government set up the Biomass Task Force and you will be aware of the Government's response.

Q541 Chairman: I have obtained one.
Ian Pearson: The Chairman has got one. As you will see from the response, and I do not have to repeat all that is in the response, there is a range of Government initiatives that the Government has following on from what we believe was a very useful report that was provided to us. It just indicates that there is a lot more that can be done in this area.

Q542 Chairman: I do not know whether you have had a chance though to have a look at one of the schedules at the back of the original Biomass Task Force report. You may have obtained a copy of it. I see you have. If you go to the back of it, I think it is Schedule Two—
Ian Pearson: I am not sure that three days into the job I actually got as far as Schedule Two.

Q543 Chairman: It was a question that we put to Sir Ben Gill and you might care simply to reflect on what I am saying. It seemed to me that there were a lot of little itty-bitty initiatives and help but that it lacked coherence as to its objectives. Looking at the summary of the response of the Government it is a sort of target-free zone when it comes to biomass. I have got no idea where you hope to end up. There is quite a lot of inspirational stuff about what you could do. The Road Transport Fuels Obligation has a clear target—5% by 2010—but in terms of the area of biomass there is not a similar target. What is the reason for that?
Ian Pearson: I think what I would want to say in response is that we are planning to produce a Biomass Strategy during the course of this year, and one of the issues that we will certainly want to address as part of that strategy will be whether or not we should set targets in this area. As a Government we have been criticised in the past for setting far too many targets but this might be an area where it could be useful to set targets. I think the sensible thing to do is to await the outcome of the Energy Review and renewables, as will be appreciated, is an important part of the Energy Review. There is also work, I understand, that is being done on a review of Waste Strategy and, of course, there is the implementation of the EU's Biomass Action Plan as well. I am keen that the Biomass Strategy needs to reflect on all those developments.

Q544 Chairman: So that strategy and timetable is likely to come out after the Energy Review is concluded or before?
Ian Pearson: After the Energy Review is concluded.
Chairman: After the Energy Review. One of the high level conclusions for example is "Government leadership through public procurement, including the commitment to carry out a mapping exercise of the potential use of biomass across the main procuring departments of the Government estate." Is that type of exercise going to then inform the strategy and actually say, "Right, well we have looked at the estate, here are some things that we are committing ourselves to do"?
Ian Pearson: As I mentioned a little earlier, we are looking very closely at sustainable procurement at the moment as a Government and, again, it is an area where we do want to encourage other Government departments to look at biomass as part of a solution.

Q545 Chairman: Let us be very specific: are you going to say to other Government departments that you would like to see them have their own individual biomass strategy? Can I just give you an example. In my own constituency there is Kirkham Open Prison which I visited with the governor and he told me about the enormous energy usage he had got. He also has a lot of farmland so I said "Have you ever thought of growing biomass and what you could not satisfy your own boilers with, do a deal with local farmers to also provide feedstock and thus achieve Government objectives of using biomass, reducing CO_2 emissions and cutting costs?" His eyes lit up, he thought this was the most wonderful idea and suggestion. I am now saying to myself "When should I write to the Home Office to get them to look at this kind of idea?" If I have understood you correctly, when your strategy comes out might be a good time to do that.
Ian Pearson: My suggestion is that every Government department is required to produce a sustainable development strategy and sustainable development action plan. You might want to be suggesting that as part of the sustainable development action plan Government departments ought to be giving proper consideration to biomass as part of their energy uses.

Q546 Chairman: Will the strategy work that you are doing also evaluate the effectiveness of the plethora of schemes that are around? I see that it was irresistible to launch yet another one, a new five-year capital grant scheme for biomass boilers with funding of £10–15 million over the first two years. A second round of the bio-energy infrastructure scheme has also been launched and it joins the long list in that schedule which I know you are going to

read with keen interest after this session. Are you going to be looking to evaluate whether all of this plethora of schemes is actually achieving what they set out to do?

Ian Pearson: We will certainly want to do that. My view on Government is that I believe in evidence-led policy making and we need to evaluate the policies that we have and the particular programmes that we operate as a Government. I would expect the strategy as being a document which summarises the key actions that we need to take which are most effective in achieving our policy objectives.

Chairman: I am going to take that as an answer yes to my question and Mr Taylor will now move on to some more evidence that he wants to discuss with you.

Q547 David Taylor: I neglected earlier on to congratulate you on your appointment and to say that I was one of many who worked in the by-election which returned you to this place, and I am pleased to see you soaring through the Government stratosphere. I want to ask for your frank assessment of the effectiveness of the fiscal and other measures that the Government have introduced in this area. Now, the Chancellor will not be forming his Cabinet for a year or more, and whatever you say will be kept within this room, so you can be as frank as you feel you ought to be. In terms of biomass, the Chairman has said that there are lots of itsy-bitsy schemes and he has quoted from some of them, and indeed in your own Department's evidence, pages four and five, there are eight categories of incentive schemes which are there to support the development of biomass. Sir Ben Gill, when he gave evidence to this Committee a week or two ago, told us of a new City academy—and I am sure you have got some private reservations about those—which was quoted £170,000 for a biomass boiler, getting in on the back of the incentives, if you like, when the actual cost was as little as £15,000 due to the confusion of advice and confusion amongst the experts in the industry. He is diagnosing the problem of take-up—and there is a problem—as being ignorance out there and confusion, the fragmented network of incentives which are there. How do you propose to address in your new role this ignorance if it does exist?

Ian Pearson: If we are firstly talking about biofuels and the incentives—

Q548 David Taylor: I am talking about biomass in the first instance.

Ian Pearson: You are talking about biomass in the first instance, okay. If you are talking about biomass, as you will see from the evidence we submitted, there are a range of areas where the Government is acting to provide support, and they are summarised in 5.1 of the memorandum that we provided in evidence. The feature of a lot of these is there are some relatively small scale schemes which are still quite new and we will need to evaluate their effectiveness as instruments. Indeed, I think the feature of a lot of the programme here is that we are still very much early days in terms of trying to promote biomass. I have some sympathy with the view that Ben Gill expressed when he said there is still some market ignorance out there as well. There are market opportunities and I think the Committee can hopefully publicise the opportunities that there are for biomass and for biofuels in the future with its report. Certainly one of the things that I will be keen to do is to see what more can be done to build this important market for the future. I think the strategy will be an important way of doing that.

Q549 David Taylor: You spoke in your evidence a moment or two ago about the biomass strategy which will be published later on this year, and a little more about that. What sort of support mechanisms have been considered for possible inclusion into this report without saying what the report might contain, because you cannot know in detail yet?

Ian Pearson: I certainly cannot go into detail at this stage in terms of the strategy. We really need to see what will come out of the energy review as well, particularly. What I think we have done though is helpfully summarise some of the activities which are already taking place to date, and they are certainly contained in the memorandum, but also in the Government's response to the Biomass Task Force report as well. That is about as far as I can go at this stage.

Q550 David Taylor: One final point, going back briefly to ECAs and the adequacy of the fiscal incentives. I think ECAs could be especially constrained amounts because they do seem to be relatively small sums involved. The Chairman said that capital allowances are a foregone tax, that is true, but all that 100% allowance is doing is re-profiling that foregone tax. The actual sums that are foregone are not significantly different over the period of the writing off, are they? The amounts are tiny. Here we are, you have acknowledged, one quarter of 1% of biofuels when the target is 5%, you have to multiply that by a factor of 20 in less than four years—April 2010—and beyond that by a factor of six or seven to go from 5% to almost a third. These are really severe mountains to climb and I am sure we can do it but the amounts we are investing, the incentives that we are giving, are relatively small, are they not, or tiny even?

Ian Pearson: As I say, on the enhanced capital allowances regime, the figures that are provided as a potential cost to the Government of this are based on our best available estimates. We are seeing increasing capital expenditure on plant investing in particularly the biofuel sector at the moment. It is very difficult I think to predict just how rapidly this market will grow but certainly I would not want to question the way the capital allowances regime has been set up at the moment. I do think it will provide a useful additional policy lever to encourage this market to grow. I have no doubt that the Treasury—once this scheme has got state-aid approval and is actually implemented, which as I say has not happened yet—will want to monitor take-up very closely as they always do when it comes to capital allowances.

David Taylor: The Treasury civil servant before you came in admitted that the investment costs were not huge, which is Whitehall speak for tiny. I hope that one of your early responses, when you are fully established in this job, will be to go back to the Treasury on this and try and improve what is really just a window-dressing scheme and may be converted into something like grants or something like that.

Q551 Chairman: I hope they do monitor it.
Ian Pearson: I do not see it as a window-dressing scheme at all. It is not the only answer when it comes to encouraging the growth of this market but I do believe that it is a scheme which will be welcomed by companies that are already in this market or potentially want to enter into the market in the future. It does give them, certainly, financial savings and an encouragement to bring forward capital expenditure which is what we want to see.

Q552 Lynne Jones: We touched earlier on the need for research in this area. I would like to raise further issues with you, and perhaps you might like to look at this. NERC has announced the closure of three of the sites for the Centre for Ecology and Hydrology. Although your predecessor in January said that this would not affect research into climate change, NERC themselves have acknowledged that there will be a reduction in the work on the prediction of climate change impacts as a result of this restructuring. Do you support this decision?
Ian Pearson: Let me say on climate change research, more broadly, that I believe this is an area where we do lead the world. If you look at the Hadley Centre and the modelling work they do, it is enormously impressive. I went and talked to some of the Hadley Centre team who were working with the Japanese in Yokohama on the super computer there and the modelling and climate change work that they have done and, as I say, we are recognised world leaders when it comes to this area. With regard to the situation with NERC, I am happy to write and set out the Government's position.

Q553 Lynne Jones: You are right that we do have an excellent science research base and it is very important that we nurture that. We have heard recently that the Institute of Grassland and Environmental Research has got a role to play in the development of energy crops yet the Government has cut its funding, why?
Ian Pearson: I am not sighted of that as a particular issue but if I am going to write to the Committee on NERC and a number of other areas where questions have been raised today, I am happy to cover that point as well.

Q554 Lynne Jones: Prospect have produced a document about the science base in this area, I have also had representations from Cropgen who are involved in biotechnology and the RSPB, for example, have expressed concern so maybe this is an area you might like to look at because if we are going to advance in this area, if we are going to have effective land use in terms of crops then we do have to have excellent research. It seems bizarre that we are cutting back in some of these areas.
Ian Pearson: I do believe that we need to have excellent research, and I am certainly aware of a number of excellent research projects which are around at the moment. I cannot comment on some of the detail of individual schemes but, as I say, I am more than happy to write to the Committee about these.

Q555 Chairman: Before we say goodbye to our first encounter with you, has your Department entirely written off a renewables heat obligation for the use of biomass?
Ian Pearson: No, we have said we will keep this under review. It is something the Biomass Task Force was not particularly keen on. They said it was potentially complex and bureaucratic but we will keep it under review.
Chairman: Minister, thank you for making Herculean efforts to get up to speed in an area where a week ago you had some knowledge and where you now, obviously, have considerably more knowledge. We are very grateful to you for keeping your predecessor's appointment with us and we are very grateful to you, also, for your kindness in offering to write to us on a number of other aspects of the questions that we have put to you. Thank you very much indeed for coming to see us.

Supplementary memorandum submitted by the Department for Environment, Food and Rural Affairs

1. When I gave evidence to the Environment Food and Rural Affairs Committee on 10 May I agreed to write to you on a number of points. The following responses are offered in the order in which they occurred in the session and are referenced in line with the transcript.

Q481

2. You asked for an update on the information supplied by Elliot Morley in his answer to your Parliamentary Question on 16 March 2005. You also asked for it to be comparable to the information given to the Committee and I have supplied the updated information in litres. You will appreciate that information, which is at annex 1, only relates to those companies, which have publicly announced their plans.

Q519

3. You asked what discussion officials from Defra had had with the industry which would give some indication of the type of projects which might be coming forward to produce biofuels in the UK. My officials have liaised very closely with officials from HM Treasury, Department for Transport, Department for Trade and Industry and the Low Carbon Vehicle partnership to gather information from industry which would inform decisions about policy options. As part of the background work for the enhanced capital allowance Defra officials contacted, through trade associations, companies which were interested in building biofuel processing plant in the UK, together with those which were already in the process of building plant. The information which they provided to us was on a commercial in confidence basis. Some have announced their plans and they are included in the table at annex 1. Others are still considering the options available to them. In summary, we already have some biodiesel production and expect to see more. There are plans for bioethanol production (work is already going ahead at the British Sugar plant at Wissington), some plans for biogas and we see the possible prospect of some second- generation productions.

Q519

4. You also asked whether normal rollover relief provisions also apply to capital allowances here. I attach at annex 2 a note on this supplied by HM Customs and Revenue.

Q528 and Q529

5. You asked about progress on work relating to carbon and sustainability assurance schemes. Government has announced that companies which are obligated under the Renewable Transport Fuels Obligation will be required to report on greenhouse gas savings and the sustainability of the renewable transport fuels which they supply. Work co-ordinated by the Low Carbon Vehicle Partnership has been progressing on the development of reporting systems for carbon savings and environmental standards and it is intended that a social standard should also be developed.

6. The carbon reporting system will relate to the whole biofuel process from the growing of the feedstock or collection of the waste material to production of the fuel. It will be consistent for different fuel pathways and will enable quantification of emissions at each stage of the production pathway. It will be transparent and applicable to both home grown and imported fuels. It will recognise the availability of different types of data and will be auditable.

7. The methodology will allow detailed calculation of emissions using both detailed real data for individual and multiple batches of fuel; or use of default values to estimate emissions at each step in the production chain or cumulatively, depending upon the extent to which the provenance of the fuel is known.

8. The methodology will be based on eight calculation modules (already developed) and detailed calculations will initially be produced for the most likely chains eg ethanol from sugar cane, wheat/grain, corn and wood; biodiesel from waste oils, palm oil and rapeseed: biogas from waste green material.

9. Work has also been progressing on the development of sustainability indicators. A report from consultants that has indicated the scope for a proposed environmental standard is being finalised. The indicators will aim to cover issues from land use change through cultivation to processing and will pull on work such as that done by the Home Grown Cereals Authority and the Roundtable for Sustainable Production of palm oil.

10. The aim is to have these standards piloted in the first half of the 2007–08 financial year and rolled out in the second half of that year so that they are ready for companies to report against by the time the RTFO is introduced in 2008.

11. Reports of work to date can be viewed as fuels working group papers on the LowCVP website at www.LowCVP.org.uk.

Q537–539

12. You asked whether GBEP would be discussing the possibility of establishing an international agreement for the sustainable procurement of biofuels and feedstocks. GBEP is a voluntary, non-binding partnership which met formally for the first time on 12 May. As such, it is too early to say how it will develop but you may wish to note that under its terms of reference, agreed by the Steering Committee, GBEP will provide a forum to analyse and develop policy recommendations on technical guidance for internationally-recognized standards. It will also seek to formulate standard guidelines to measure greenhouse gas emissions reductions which will include development of baseline methodologies and monitoring tools. Therefore, we are confident that GBEP will contribute to efforts to promote efficient and sustainable production and use of bioenergy though not necessarily via formal international agreements.

Q552

13. I said that I would write to you about the Natural Environment Research Council's restructuring of its Centre for Ecology and Hydrology (CEH) and closure of several CEH sites.

14. CEH is wholly-owned by NERC and provides independent research and training in the environmental sciences. NERC Council has recognised for some time that the current structure of CEH is unsustainable. In December 2005, NERC put to consultation plans for a new shape for CEH. These plans were informed by a strategic review that involved extensive consultation with stakeholders including Defra. Scientists at many of its sites contribute each of CEH's six science areas to. The restructured CEH will consist of four sites and will still allow all scientific areas to continue. This re-shaping and restructuring of the science teams will enable CEH to sustain the delivery of high-quality environmental science. It will also retain sufficient geographical spread across England, Scotland and Wales for CEH to carry out its research activities.

15. The restructured CEH would continue to deliver research under its current scientific areas: Biodiversity, water, biogeochemistry, climate change, sustainable economies, and environmental informatics.

16. The Government is fully committed to maintaining the quality of environmental science in the UK, recognising the important contribution this makes to understanding and addressing issues such as climate change and biodiversity. The Department of Trade and Industry provides funding to NERC to support research and related postgraduate training in environmental sciences for this purpose, and the NERC science budget allocation has doubled since 1997 to £334 million for this year. It is the responsibility of NERC Council to decide what environmental science it should fund and where, in order to deliver its Charter objectives and its mission. NERC, therefore, has a responsibility to keep under review all the scientific work it funds, including that within its Research and Collaborative Centres, such as CEH.

17. NERC consulted widely with stakeholders on its proposals on how CEH can become a more sustainable organisation. Defra submitted a formal response to this consultation which can be found on the Defra website at http://www.defra.gov.uk/science/news/default.htm. NERC announced on 13 March that Council had confirmed its plans to re-structure the CEH.

18. Defra supports the need to establish a sustainable CEH. We acknowledge the risks in the restructuring and delivery in a number of science areas and the impact of these will need to be monitored carefully in the light of the benefits of restructuring to the wider climate change and R and D effort.

Q553

19. I also said that I would write to you about the Institute of Grassland and Environmental Research (IGER).

20. IGER is an important research partner for Defra in the development and delivery of our policy objectives, in particular on sustainable farming and food. As a customer for the services provided by IGER, Defra has an interest in the maintenance of areas of scientific expertise and service provision that relate to our present and developing needs. This is reflected in the department's continuing significant investment at IGER, where we are already committed to investing over £5 million in research programmes in 2006–07. Further project proposals are under negotiation and we anticipate the department's final commitment will be nearer £5.5 million, excluding our contributions to relevant LINK project consortia. By comparison, Defra's research investment at IGER in 2005–06 was approximately £5.8 million, excluding LINK projects.

21. Defra is funding research at IGER on the development of miscanthus for energy crop production and we are fully committed to that research until 2009.

22. The context for the change in Defra's investment at IGER is that Defra's needs for scientific evidence and, therefore, the expertise required within the scientific community to service those needs are changing. This has been documented in our Science Forward Look[1] and our recent consultation document on our Evidence and Innovation Strategy[2] and will again be reflected in our finalised Evidence and Innovation Strategy due to be published this summer. We are working with IGER to ensure it is able to match its skills to our needs both now and in the future. We have identified a need to step-up our investment in a number of areas, largely to better align with our strategic priorities on climate change, sustainable development, protecting natural resources and rural communities. This refocusing of research programmes will mean a reduction in our investment in farming and land-based research, including grassland and livestock sciences. Although this in turn may affect the volume of new contracts we are able to place at a number of organisations, including IGER, we will continue to be a major investor in biological research on sustainable agriculture into the future. Of Defra's £160 million research budget for 2006–07, almost half is allocated to sustainable farming and food.

Ian Pearson MP,
Minister of State (Climate Change and the Environment)
Department for Environment, Food and Rural Affairs

June 2006

[1] Evidence and innovation: Defra's needs from the sciences over the next 10 years, July 2004 http://www.defra.gov.uk/science/publications/documents/ScienceForwardLook3rd.pdf

[2] Evidence and innovation Strategy 2005–2008—consultation document issued October 2005 http://www.defra.gov.uk/corporate/consult/ei-strategy-eis-consult.pdf

Annex 1

PLANS FOR RENEWABLE TRANSPORT FUEL PLANT

Company	*Location*	*Type of biofuel*	*Capacity in litres per annum*	*Feedstock*	*Current situation*
Argent Energy	Motherwell	Biodiesel	50 million	Animal fats (and used cooking oil)	Started operating Feb 2005. Considering further plants in the UK
Biofuels Corporation Ltd	Middlesbrough	Biodiesel	284 million	Oilseed rape (and other virgin vegetable oil)	Plant now operating since February 2006 and the Board considers appropriate to proceed with design for second plant
Global Commodities (UK) Ltd	East of England	Biodiesel	30 million	Recycled vegetable oil	Current small plant plans to build new 180 million litre plant
Greenergy	Humberside	Biodiesel	114 million	Various virgin oils	Plant due to be on line end of 2006. Plans to double capacity at this plant and feasibility study for additional plant in Liverpool
British Sugar	East Anglia	Bioethanol	70 million	Sugar beet	Under construction. Due to be operational early 2007. Further plants under consideration
Greenspirit	South West	Bioethanol	130 million	Wheat	Expected to commence production 2007. Other plants under consideration
Losonoco	Ince, Cheshire	Bioethanol	115 million	Biodegradable waste	In planning process
Losonoco	Edmonton, London	Bioethanol	95 million	Biodegradable waste	In planning process
Roquette	Midlands	Bioethanol	120 million	Wheat	Expected 2008?
Organic Power	Castle Carey, Somerset	Biomethane	1 million cubic metres of biogas	Organic waste	Under construction
Ineos Enterprises	Grangemouth, Scotland and other alternative locations in England are being considered	Bioethanol & biodiesel	100 million litres from Grangemouth		
Gasrec Ltd	Planned application pending for Albury, Surrey	Biomethane	planned capacity 4,800,000 kgs of cnLBM /yr	Landfill gas	Planning application due for determination 15 July 2006. Detailed application and Hazardous Substances Application lodged. Now in receipt of the Green Fuel Challenge and will be the only nominated company drawing on the benefits of the Award for the purposes of producing a bio-fuel.

Annex 2

Whilst roll-over relief is generally viewed as a concept for capital gains tax, in the context of capital allowances, the arrangements which allow expenditure to be pooled in order to calculate writing down allowances, balancing allowances and balancing charges could be seen as providing a rollover of the disposal proceeds on the disposal of the asset within the general pool against the unrelieved spending in the pool. For spending that qualifies for first year allowances, I can confirm that unrelieved spending, after the allowances have been computed, can be added to the general pool, provided that the spending is not required to be pooled separately under the general rules for plant and machinery capital allowances. Where a business claims 100% first-year allowances on qualifying spending, the spending would have been fully relieved so the value added to the general pool would be nil. On the other hand, businesses that cannot take immediate advantage of first-year allowances because they have insufficient profits to give them full effect, can still claim them and capital allowances more generally, to augment a loss to carry forward against profits in future years. Alternatively a business that chooses not to claim first-year allowances can carry forward its unrelieved expenditure against profits in future years.

HM Customs and Revenue

May 2006

Memorandum submitted by HM Treasury (Bio 33)

Enclosed are four papers:

A. Note on how the 20ppl biofuels duty incentive was arrived at.

B. More information on the proposed biofuels ECA scheme.

C. Govt assessments of carbon savings from different policy routes.

D. A specific type of biofuels production process—Losonoco's acid dilute hydrolysis—and how it works. This note is from Alan Banks, CEO of Losonoco.

A. Note on the 20ppl Duty Differential for Biofuels

A duty differential of 20 pence per litre was introduced for biodiesel from July, 2002, and for bioethanol from January, 2005.

In deciding that the duty incentive for biofuels should be set at 20 pence per litre (ppl), Ministers took a number of factors into account. The starting point—and the primary consideration—was the environmental benefits that biofuels offered, in the form of reductions in CO_2 emissions of the order of 55%. It was possible to quantify the monetary value of these savings at about 3ppl, drawing on analysis within Government on the marginal social cost of carbon, which established a figure of £70 per tonne in 2000 prices, rising at the rate of £1 per year in real terms.

Ministers also considered other benefits that could be gained from increased use of biofuels, including security of fuel supplies, development of new technologies and recycling of waste products. Although it was difficult to quantify these benefits in monetary terms, Ministers concluded that they justified increasing the duty incentive above 3ppl. In setting the final figure, Ministers took into account also that biofuels production costs were greater than those of conventional fuels, and they concluded that it would be appropriate for the duty incentive to reflect some contribution to those additional costs. Ministers also took the view that it was desirable for all sectors to make a contribution towards carbon-saving, and 20ppl was broadly comparable to the costs of other carbon-saving measures in the transport sector.

The decision taken by Government to introduce a Renewable Transport Fuel Obligation, announced in November 2005 and built on in the Budget 2006 announcements, builds on the Government's policy commitment to biofuels. It sets out a long-term framework, giving the industry the additional certainty they have requested, while seeking to ensure biofuels can be delivered at the lowest economic cost over time through seeking to exploit economies of scale and by developing innovative production techniques such as second generation biofuels. Extending the 20 pence per litre duty incentive to 2008–09—the first year of the RTFO—also responds to the desire of the industry to maintain certainty.

B. Exchequer Cost Calculations for the Proposed ECA for Cleanest Biofuels Plant

Background

1. Capital allowances allow the costs of capital assets to be written off against a business's taxable profits. They take the place of depreciation charged in commercial accounts. The main rate of allowances for plant and machinery is 25% per year, on a declining balance basis.

2. Enhanced Capital Allowances (ECAs) allow a greater proportion of the cost of an investment to qualify for tax relief against a business's profits of the period during which the investment is made. They bring forward the time tax relief is available for capital spending.

3. The proposed ECA will allow businesses investing in the "cleanest" (most carbon-efficient) biofuels production installations to claim 100% relief on eligible plant and machinery (though it should be noted that implementation of the ECA is subject to State Aid approval).

Cost calculation process

4. The net Exchequer effect of a Budget measure is generally calculated as the difference between applying the pre-Budget and post-Budget tax and benefit regimes to the levels of total income and spending at factor cost expected after the Budget.

5. Investment data underlying the ECA cost calculations is based on stakeholders' own investment projections, shared with Treasury/HMRC on a confidential basis during stakeholder discussions. For each year's projected investment in the cost calculation, we calculate the current capital allowances available (without the ECA) and those after the scheme's introduction. In the "current" (without ECA) scenario we assume that 5% of investment would have qualified for the existing ECA for energy saving technologies (eg investment in good quality Combined Heat and Power, CHP)[3]

6. We make the following assumptions about the businesses involved:

(i) They are all incorporated and pay corporation tax at the main rate of 30%. This represents a cautious assumption for smaller companies, which may pay corporation tax at a lower rate[4].

(ii) They have sufficient taxable profits to claim their capital allowances against, and they claim the available capital allowances in full at the earliest opportunity[5].

7. Costs are calculated as the difference between the estimated relief claimed with and without the ECA. After making adjustments to allow for the delay between when investment is made and the effect on tax receipts is felt, we estimate costs as follows:

	2007–08	*2008–09*	*2009–10*
Exchequer effects[6] (£m)	–30	–20	–35

8. Because of our cautious approach to both the projected investment figures used and the necessary assumptions, these represent the upper bound of expected costs of the ECA.

9. These costs differ slightly to those included in the Partial Regulatory Impact Assessment (RIA) published in December 2005 and in the 2005 Pre-Budget Report. This is because our cost estimates were revised at Budget 2006 as a result of updated stakeholder information on proposed investment.

C. Government Ranking of Climate Change Policies

The Climate Change Programme Review, published on 28 March, 2006, and documents published alongside it provide the most up to date and comprehensive comparison of the cost of carbon abatement. This can be found at:

http://www.defra.gov.uk/environment/climatechange/uk/ukccp/index.htm

Greenhouse Gas Policy Evaluation and Appraisal in Government Departments (Chapter 3, from page 21–23), published by Defra, explains how the Government can go about ranking different policy interventions and the pros and cons of each measure. This can be found at:

http://www.defra.gov.uk/environment/climatechange/uk/ukccp/pdf/greengas-policyevaluation.pdf

[3] This is a conservative estimate of the level of investment that would qualify for the existing ECA; the majority of cases involve CHP, which typically represents more than 5% of total investment costs for the plants involved. In addition, some other qualifying technologies may have a more modest application in the manufacture of biofuel.

[4] This will also differ from the tax rates paid by any unincorporated businesses, but we expect the majority of claimants to be companies.

[5] In reality allowances are not always claimed at the first opportunity, and where there are no taxable profits even those that are claimed may be used to create losses that aren't utilised until later years. This assumption is therefore a cautious one.

[6] I.e. negative figures represent an Exchequer cost.

Synthesis of Climate Change Policy Evaluations, also published by Defra, looks at the past and projected emissions savings of current policy measures, and ranks them by cost effectiveness (see page 21–33). This can be found at:

http://www.defra.gov.uk/environment/climatechange/uk/ukccp/pdf/synthesisccpolicy-evaluations.pdf

The Partial Regulatory Impact Assessment (RIA) on the Renewable Transport Fuel Obligation (RTFO), published on 10 November, 2005, alongside the Feasibility Study on the RTFO, set out figures for the estimated resource costs of biofuels (see section 5, pages 14–15). This can be found at:

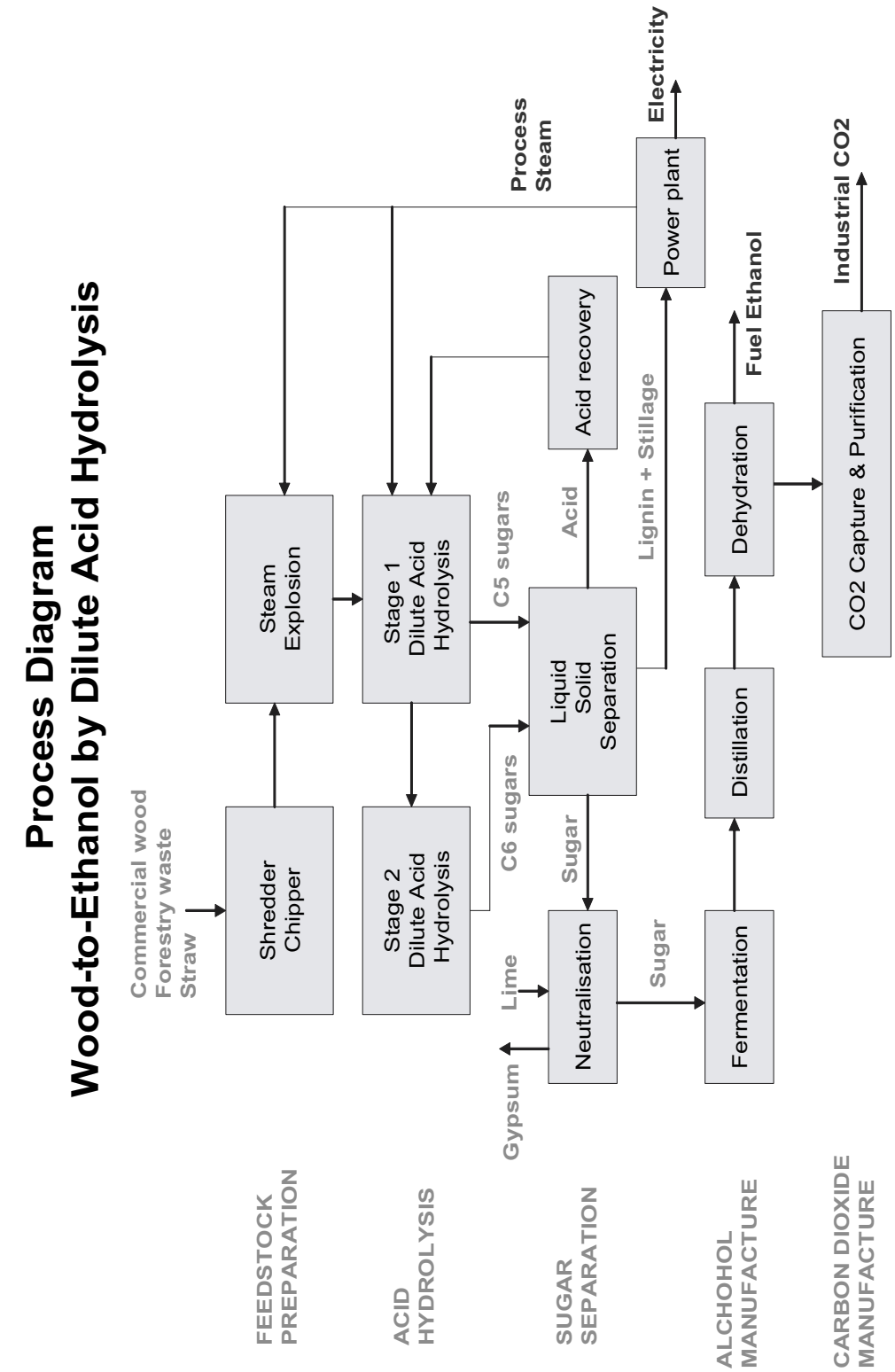
http://www.dft.gov.uk/stellent/groups/dft—roads/documents/pdf/dft—roads—pdf—610330.pdf

D. Losonoco: Tomorrow's Fuel Today

Process Description May 2006

Losonoco has developed a process to convert lignocellulosic biomass (woody biomass) into fuel ethanol. The principal by-products of the process are liquified, purified carbon dioxide which is sold as an industrial gas, and clean biofibre which is used for power generation.

Losonoco's process is based on two-stage dilute acid hydrolysis. It produces very little waste and features negligible emissions. The whole process has been designed as an environmental solution for the re-use of forestry, construction, municipal and agricultural waste streams. By extracting the sugars from woody biomass before using it for power generation we are effectively creating two energy products in place of one: low-emission transport fuel and electricity instead of just electricity. The diagram below summarises the process:


Process Diagram
Wood-to-Ethanol by Dilute Acid Hydrolysis
Commercial wood
Forestry waste
Straw
Shredder Chipper
Steam Explosion
Stage 1 Dilute Acid Hydrolysis
Stage 2 Dilute Acid Hydrolysis
C5 sugars
C6 sugars
Liquid Solid Separation
Acid
Acid recovery
Lignin + Stillage
Power plant
Electricity
Process Steam
Lime
Gypsum
Neutralisation
Sugar
Sugar
Fermentation
Distillation
Dehydration
Fuel Ethanol
CO2 Capture & Purification
Industrial CO2
FEEDSTOCK PREPARATION
ACID HYDROLYSIS
SUGAR SEPARATION
ALCHOHOL MANUFACTURE
CARBON DIOXIDE MANUFACTURE

The process for converting lignolellulosic biomass into ethanol has five main steps:

— Feedstock preparation: Chopping, shredding and steam treating the feedstock to soften it and start the process of breaking down the lignin.

— Acid hydrolysis: Using dilute acids, temperature and pressure to break open the lignin and release the natural sugars.

— Sugar separation: Removing the acid/sugar solution from the hydrolysate; separating the sugar from the acid and neutralising it.

— Ethanol manufacture: Fermenting the sugars into a "beer"; removal of the wet ethanol from the beer by distillation and removing the water from the ethanol.

— Carbon dioxide manufacturing: Capture, purification and liquification of the carbon dioxide.

As previously explained there is a strong industrial symbiosis with power generation, and Losonoco's engineering designs include a bio-power co-generation facility. The ethanol plant provides the power plant with high energy content bio-feedstock which is combusted to produce steam which is passed through a turbine to produce renewable electricity. The ethanol plant uses the power plant's waste steam as its main energy source, and returns the water from the steam so it can be re-cycled back into power production.

Feedstock Preparation

Woody biomass is essentially comprised of cellulose and hemicellulose-based sugars wrapped in lignin. The cellulose provides C6 sugar molecules (similar to glucose) and the hemicellulose provides C5 sugar molecules (similar to zylose). Losonoco's acid hydrolysis process un-wraps the lignin and releases the sugars. The output from this process is a soggy fibrous material comprising lignin, acid and dissolved sugars.

Lignin is a very tough substance consisting of plant fibre and various resin and glue-like compounds. Losonoco uses a two step process to break down the lignin and release the sugars:

Step 1: Preparation: The feedstock is chopped and shredded down to pieces of no more than 2 cm length. This is to increase the surface area to ensure consistent wetting by the acid solution and steam and to make the feedstock easier to handle in a continous flow system.

Step 2: Steam Explosion: The chopped wood is passed into a pressure'vessel where it is rapidly heated to around 220°C for five minutes by the action of steam. At the end of the heating period the vessel is vented to air which rapidly drops the pressure and "explodes" the lignin. It is not in fact an explosion but the rapid decompression softens and opens up the lignin fibres to make them easier to break down with acid.

Dilute Acid Hydrolysis

Dilute acid hydrolysis is a continuous flow process. The chopped and steam softened feedstock is passed by conveyor into a funnel leading to a bank of six vertical digestion vessels of 5 tonnes capacity each. These are standard digesters as used in the paper industry with the difference that they are lined with titanium or an equivalent material such as monium. This is done to prevent decay of the vessels from the hot acid process. On entering the digesters the feedstock is sprayed with dilute sulphuric acid at a concentration of 0.8% to 1.4%.

The digesters have artesian screws inside them to pass the acid-wetted feedstock through and out into the liquid/solid separators. The digesters are maintained at a temperature of around 180°C by use of a steam jacket, the steam being waste steam provided by the power generation facility, and at a pressure of around 2 bar. Residency time in the digesters is around 10–12 minutes during which time the sugars are hydrolysed from the lignin. The hydrolysis process is a catalysed chemical reaction and occurs instantanously once the feedstock reaches the correct operating parameters.

Losonoco will be using a two-stage hydrolysis for the eucalyptus wood. This wood contains around 40% by wood cellulose, which produces C6, or glucose-like, sugars and 20% by weight hemicellulose which produces C5, or xylose-type sugars. The first hydrolysis stage releases the C5 sugars from the feedstock, and the second stage releases the C6 sugars.

Sugar Separation

The output from the digesters is a soggy fibrous mass containing the solid lignin and the liquid acid and sugars. A polymer, for flocculation, is added and the acid and dissolved sugars are separated from the lignin in one of four vertically stacked filter presses.

The lignin is dried and mixed with the waste biosolids from the fermentation process. It will be sold to the proposed co-located power generation facility for use as a solid fuel. The energy value of this solid fuel is around 29 GJ/dry tonne which is 45% higher than the energy value of the eucalyptus wood itself which is around 20 GJ/dry tonne.

The acid/sugar filtrate from all four presses is pumped through a primary mechanical filter and a final resin guard filter to the acid/sugar separation units where the acid is removed by anionic exchange. The sugars are neutralised by the addition of lime and this produces the only significant waste product of the process, gypsum, the amount of which depends on the amount of lime used and the acidity of the mix. Another benefit of liming is that any impurities in the acid-sugar mix caused by impurities in the feedstock are captured by forming compounds with the lime.

Ethanol Manufacture

The sugars are concentrated in an evaporator before being passed into a bank of six fermentation tanks. Losonoco uses a proprietory "thermophyllic" fermentation process in closed fermentation tanks. Thermophyllic fermentation improves on standard yeast fermentation in three important ways:

- Yeast fermentation will only convert the C6 sugars to ethanol, whereas thermophyllic fermentation will convert both the C6 and C5 sugars, providing a 20% increase in the ethanol yield.
- Thermophyllic fermentation occurs around three times faster than yeast fermentation which provides significant gains in process efficiency.
- Thermophyllic fermentation takes place at 65°C compared to 32°C and is exothermic—that is it gives off heat. The hotter fermentation broth means that much of the ethanol evaporates off during fermentation to be captured in the distillation train. This continuously reduces the ethanol concentration in the broth which benefits the fermentation process.

The ethanol is removed from the "beer" using standard distillation equipment and steam from the gasifier. At first hydrous ethanol is produced and this is de-watered to 99.5% anhydrous ethanol in a two step process: steam is used to get the ethanol to around 77%, followed by membrane filtration. The ethanol is stored in standard cylindrical, cone-bottomed gasoline storage tanks.

Carbon Dioxide Manufacture

A great deal of carbon dioxide is given off during fermentation. It is captured and passed to a standard purification plant where it is purified to industrial or potable standards. This carbon dioxide is sold into the food, beverage and industrial process industries.

HM Treasury

June 2006

Written evidence

Memorandum submitted by Powys County Council (Bio 01)

THE UTILISATION OF WOODFUEL FOR HEATING

1. *The Scope of the Inquiry and this Paper*

The term, bioenergy and the commonly used, biomass, are not at all helpful to understanding or building public confidence. A recent internal document of the European Commission suggested that comparing the various technologies available under the term "biomass" is not a matter of "apple and pears" but "cows and trees". There is virtually nothing in common between an anaerobic digester utilising agricultural wastes, a wood pelletiser and a bio-diesel plant—other than that they are all producing renewable fuels. The processes that produce that fuel are hugely different, the raw materials are different and the end use different. It is not difficult to understand why the Committee has chosen to frame its inquiry as it has but neither would it be surprising if the range of evidence ends up being difficult to manage. This submission concentrates upon two fuels that derive from timber—wood chips and wood pellets, and refers to them both as woodfuel. A third type of woodfuel—logs, is not further mentioned as it is not very often used in the most efficient modern automated boilers.

2. *Scope for Utilising Woodfuel in the UK*

We, in mid Wales have drawn huge inspiration from our long-time partners in Upper Austria where there has been a massive boom in woodfuel heating over the last eight years or so. Well over 30% of Upper Austria's energy use comes from renewable sources and almost all of the growth is in the solar, and particularly woodfuel sectors. Almost 50% of all new homes have wood pellet heating systems and more than 300 woodfuel district heating networks exist. Whilst there are reasons why this level of achievement and growth may not attainable in the UK, there is sufficient evidence from Austria to say that some of it could be ours given the right level of support.

2.1 The forestry industry is stronger in Austria, and the level of tree cover higher but there are still fairly obvious examples in the UK where the type of integrated pellet production and combined heat and power operations could not be developed at saw mills. The Balcas plant in Northern Ireland could be the first of many if the market was supported adequately.

2.2 It is standard for Austrian houses to have cellars/basements and this is the normal location for the wood pellet boiler and fuel store. The UK situation is clearly different but there are still many opportunities for adapting or adding outhouses or extensions—the fuel store can be up to 20 metres from the boiler.

2.3 As has been demonstrated in mid Wales amongst other places in the UK there is considerable scope for the utilisation for woodchip boilers for heating larger buildings such as schools or offices. There is no shortage of fuel for the existing level of demand without resorting to especially grown material. Two small local saw mills for instance are competing to supply Llandrindod High School and Leisure Centre with woodchip fuel, whilst the Ceredigion Council Offices in Aberaeron are utilising waste material from a fencing stake production unit. If we establish a growing and confident woodfuel market on what we have now, we can easily grow more to meet rising demand.

3. *The Cost-effectiveness of Woodfuel*

The evidence from mid Wales is that it is the capital cost of woodfuel boilers that is the stumbling block to wider implementation. The revenue costs of woodchip are now below oil and bottled gas and close to mains gas. Pellets too are out-competing oil and lpg—the issue here is their availability and support is needed in this sector. The evidence from Austria and Germany is that woodfuel prices are relatively stable whilst the fossil fuel prices are extremely volatile.

4. *Comparing Woodfuel to other Fuels with Respect to Carbon Savings*

Woodfuel is usually deemed to be carbon neutral so long as the material comes from sustainable sources and thus it is only the processing and transport costs that need to be considered as generating carbon. There is obviously huge advantage in utilising any woodfuel as close as possible to its point of production and in using as little energy as possible in processing. Woodchip fuel is best produced from naturally seasoned small diameter round-wood or saw mill waste. Modern boilers can tolerate quite high moisture content so there is no need to artificially dry the timber. Wood pellets do need more processing but the resultant fuel is relatively dense and dry.

4.1 Apart from biogas, or conceivably renewable electricity, there is no other currently available renewable heating fuel. Solar (thermal) energy can be used to top up another fuel but it is not yet able to provide the whole load for other than the most super-insulated of ecobuildings. Ground (or air or water)

source heat pumps are often sold as being "renewable" but are completely reliant upon another fuel source to power the heat pump. Unless the electricity comes from a renewable source, the heat pump does little other than reverse the inefficiencies of production and transmission.

4.2 Woodfuel quite clearly out-competes natural gas, lpg, oil, coal and electricity in terms of reducing carbon emissions. Even wood pellets imported from Canada would be much more carbon efficient than any of the fossil fuel alternatives.

5. *The Sustainable Production of Woodfuel*

This is an area that is of some concern to many of us. We would like for there to be a recognised "eco" standard for woodfuel that reflects its means of production, harvesting, processing and transportation. This will need to be flexible enough to reflect the clear differences between crops grown on arable or improved pasture land and those derived from woodland, forests and (conifer) plantations. The standard should include fertiliser and other inputs, protecting/enhancing bio-diversity during the growing of the wood, leaving sufficient dead material behind following harvesting, soil conservation and the protection of surface and ground water. We would very much like to be involved with the preparation of such a standard.

6. *Impact of UK Government and EU on Woodfuel Market*

The impact to date in the UK has been pitifully little and this arises by a general lack of awareness of the opportunities and a seeming fixation on electricity. Even where woodfuel, or other biomass for combustion crops, have entered the thinking of Government it has usually been in the context of generating electricity. This bias, along with a liking for the larger-scale, has meant that combined heat and power options have been largely ignored. Woodfuel and biofuels in general may be renewable but they are not in infinite supply so why would one want to use them inefficiently? Burning them in plant where most of the energy is dumped in the form of waste heat makes no sense at all.

6.1 Utilising woodfuel in modern automated boilers, with efficiencies up with their gas equivalents, to heat homes, offices, schools and factories seems to be a much better use of this precious renewable resource than generating electricity at 30% efficiency. Investment by the government in supporting the development of woodchip and pellet supply industries, as well as assistance with capital costs and promotional activities would be vital to the rapid growth of this technology in the UK. We have an insight in this part of the world of the potential for growth as we have seen a relatively high level of interest in wood pellet and wood chip heating installations. We have benefited hugely from various grant schemes that have utilised largely EU money. We have also been greatly assisted, particularly on the pellet side, by our contacts with Upper Austria. Almost all of the growth is coming through the installation of Austrian boilers.

6.2 As for the impact of future government action; this would appear to lie in the balance. The "Clear Skies" grant was relatively easy for individuals to access and provided easily understood grant aid towards automated woodfuel systems. If this scheme is superseded in the manner threatened in the consultation paper last year, or if there is a break in grant availability, the slow growth in boiler sales will be severely curtailed. The grant scheme needs to be expanded not curtailed. There is enough experience in Wales, in association with our Austrian partners, to clearly demonstrate that we could be on the verge of a major growth in low-carbon heating systems utilising woodchip and wood pellets but the industry needs support if it is realise its full potential.

6.3 As is often the case with sustainable development issues, the EU is ahead of the UK Government and it is usually EU money that has been utilised here in mid Wales to promote growth in this sector. We need the UK Government to wake up to the opportunities.

7. *The Level of Necessary Support*

A grant of around 40% of capital costs would probably be enough to see a very rapid growth in the installation of woodfuel boilers. It should be virtually automatic with limited bureaucracy, an approved list of boilers and installers and, very importantly, a guaranteed life of the scheme of at least five years. This would probably be enough to kick-start the industry very well, including the development of woodfuel supply chains. For a typical domestic installation the grant might be around £4,000 which represents excellent value in bringing about very effective carbon reduction measures, a reduction on fuel imports and significant economic development spin-offs. The (Austrian) pellet boiler manufacturer with probably the greatest level of activity in the UK market will be building two new factories in 2006—such is the level of growth in business. Unfortunately, neither factory will be in the UK.

7.1 In order to shift policy in the right direction there needs to be realisation that this market exists and can, potentially, make a huge contribution to hitting our carbon reduction targets. A massive amount of energy goes into heating our buildings and water and there is no serious renewable alternative to woodfuel (with solar) at present. Once the opportunities are understood then a shift in policy will follow. Support will need to be given to the Energy Efficiency Advice and Energy Agency network to deliver impartial advice at the local level and policy measures need to be put in place that encourage planning authorities and developers to favour woodfuel either with individual installations or community heating networks.

8. *Increasing the Supply of woodfuel*

The woodfuel supply chain depends upon two basic commodities both of which are often considered to be a bi-product of the timber/forestry industry. Woodchip is supplied from small diameter timber or saw mill waste slab-wood. It could also be supplied (with rigorous controls) from clean waste wood from pallets or construction projects, for example. There are also large tonnages of chipped timber arising from pruning and felling along transport corridors and in parks and gardens on a renewable basis. Where competition arises for the utilisation of such timber it is usually from the manufacture of fibre board and the like. If a source of woodchip is not close to a manufacturing facility for such products then transport costs often wipe its gate price. Pellets are made from sawdust and shavings, and saw mills and timber processing facilities are the obvious source of such material. Animal bedding and equine arenas are some of the alternative uses and are relatively high in value.

8.1 Given the bio-diversity and recreational benefits and the huge net importation of timber into the UK, the encouragement of further native tree planting would provide further raw material for timber and the woodfuel bi-products. A buoyant woodfuel industry would encourage the management of existing farm woodlands, the exclusion of livestock—allowing regeneration, and the thinning of plantations—providing a better end product and ecologically richer and much more usable and attractive forests. The expansion of the woodland cover in the UK would have significant benefits in terms of the mitigation of the some of the problems associated with climate change—particularly the slowing of run-off to water courses during periods of heavy rainfall.

8.2 Short-rotation coppice probably has its part to play too but the right opportunities need to be carefully selected.

9. Conclusion (and Executive Summary)

I. Woodfuel is a specific opportunity and is very different to other technologies that come under the heading "bioenergy" (which are also very different from each other).

II. There is sufficient evidence from Austria in particular, and the fledgling industry in the UK, that there is tremendous potential for the displacement of, often imported, fossil fuels with locally produced woodfuel.

III. The advantages in developing this industry for the efficient production of heat energy from timber bi-products are enormous. There is no obvious serious, commonly available, renewable energy alternative although installing solar heating in parallel has clear advantages.

IV. The technology should be supported through government grant for boiler installations. This level of support would be cost effective and would provide confidence to those in business that are needed to invest in the fuel supply chain, boiler manufacture, distribution, installation and servicing.

V. The technology should be promoted at a local level using the existing and expanded network of energy advice centres and energy agencies.

VI. The woodland and forest cover of the UK should be expanded with the existing tree cover better managed. Growing timber specifically for fuel should only be encouraged in circumstances where the overall ecological benefits can be established in advance.

VII. All woodfuel should be used as efficiently as possible and should rarely, if ever, be used to generate electricity without the productive utilisation of the "waste" heat.

Powys County Council

January 2006

Annex A

Endorsements

1. *Dulas Ltd*. Dulas would certainly like to support/endorse your report.We have seen an enormous growth in the interest for our woodfuel heating solutions. This year we expect a 100% increase in turnover in the woodfuel business, which is still reliant on grant support.

2. *Welsh Bio-Fuels Ltd.* I am writing to fully endorse your submission to the Parliamentary EFRA Committee Inquiry into Bioenergy.

3. *Glasu*. (Leader + group in Powys). Glasu whole-heartedly supports your report.

4. *Mid Wales Energy Agency*. Please include MWEA's endorsement too.

5. *Organic Energy Company*. We support your paper concerning wood fuel heating in the UK.The market for automated wood pellet boiler systems is small but growing rapidly, we believe without capital grants to assist growth it will be very difficult to achieve positive environmental changes. There are also economic benefits to be considered, our company is expanding to meet demand and increasing employment locally and nationally.

Memorandum submitted by Land Network International Ltd (Bio 02)

1. Scope for Biofuels to Contribute to Tackling Climate Change

Some years ago I put a figure as follows to Prof Lynne Frostick who is the Head of The Centre for Waste and Pollution Research (it still exists but they have changed its name recently); I thought that there was possible 100 millions tonnes a year in the UK which had been collected and put down holes (which means the money is spent) which could come into agriculture. Her response was "I think you will find it is a little more than that". Whatever that figure is, I did a rough calculation based on the 100 million tonnes per annum and thought that it would probably, if it were incinerated, produce 75 million tonnes of carbon dioxide per annum (which is roughly equivalent to 10% of the Kyoto Protocol estimate of total UK production). All forms of incineration, including EfW plants, would produce that carbon dioxide. However, if that material is used, via composting, as fertiliser and a substitute for what farmers purchase a mineral fertiliser, then that material would go into the land and we could lock up the carbon. Generally speaking, in basic principle, biofuel production is carbon neutral; carbon dioxide is taken out of the air by plants (at the beginning of the process) combined with water in the plant (which uses energy from the sun to drive the process) and we eventually produce a fuel which is finally burnt, so pushing carbon dioxide back into the atmosphere. So, the process is front-end driven which is a bonus. However, people argue that there is a carbon cost in the logistics of planting the crop and harvesting it. This is quite true. However, it is well to remember that a hectare of land will produce, in a good year, about two tonnes of oil seed rape seed per harvest. However, the oil used (which is burnt and pushes Carbon dioxide back into the atmosphere, will only be, even after two pressings, about 42% of the seed weight. On top of this the crop will produce something in the region of four to seven tonnes of dry matter per hectare above the ground and about the same again below the ground. If the crop wastes are incorporated into the soil and direct drilling is used, then there will be an accumulation of Carbon molecules in the soil and a build up. With appropriate cultivation techniques, probably not more than about 10% of that Carbon will be oxidised to Carbon dioxide every year. There are low emissions of some other gases including Nitrous Oxide which are also greenhouse gases. Nevertheless, using this technique there would be a major contribution to reduction of greenhouse gas volume.

Also see appendices.

2. Cost Effectiveness of Biomass and Biofuels

While "biomass" has a place, it depends what is meant by the word and how it is handled. If a crop is grown especially for the purpose, for example Willow or Miscanthus, then that crop will, when standing in the field before harvest, have probably 70–95% water in it. That water has to be handled and removed. If the material is stacked to dry out, then it has to be double handled. It is a fact that although this process has been tried in many parts of the world, and tried successfully, it has never become really large-scale activity.

Biofuels to produce liquid fuels that can be used in vehicles and central heating systems, appear to be more attractive. However, there are two difficulties. Firstly, under current economics because of the tax that has to be paid at the pump for vehicle users, biofuel production is not attractive in the UK. The commercial economics, however, do stack up to produce oil seed rape in the UK and ship it to Germany where it is pressed and turned into biodiesel and sold at the pumps. Secondly, the environmental energy equations are not at all attractive if the crop is produced using mineral fertiliser. The production of mineral nitrogen fertiliser is very energy expensive. (See also in appendices.) However, this equation is changed dramatically and to significant advantage if the Nitrogen fertiliser required to grow the crop comes from wastes that are applied to the land by composting or direct spreading, preferably with proximity logistics planned and used. From any point of view, crops to biofuels are superficially exciting but, in reality, not really very attractive. Waste to crops to biofuels is dramatically different and very positive.

3. Carbon Savings from Biofuels

This has been largely talked about in Paragraph 2 above and in the appendices. We also have a project running with Lincolnshire County Council that would be looking to put figures on these equations.

4. Sustainable Production of Biofuels on Farms

Covered under item 3 above.

5. Impact of Government Actions

Government at EU and UK level can and will affect bioenergy production by providing changes in taxation of vehicle fuels to support biofuels, extended capital allowances on investment in biofuel plants, grants via WRAP and other bodies, manipulation of Cross Compliance on farms and so on. However, government appears to find it very difficult to understand one thing that is much more important than all these things put together. Environmental regulation, like all regulation, has two functions. Firstly, it is to

police the bad guys. That is necessary and fundamental in all societies. Secondly, it is to enable the good guys. "Enable" depends on regulations which are common sense-based, and sound practical technology and implemented by a personnel structure which makes decisions rapid. It is worth repeating this; common sense, technology and speed. The logic is quite simple; if it is economic and sustainable, business will go and borrow the money and do the job. It doesn't need incentives. All incentives do is make it easier but common sense, technology and speed will deliver. What we don't want is inhibition.

6. Financial and Policy Support

The UK, like all developed economies is very heavily dependent on the manufacture and use of motor vehicles. They happen to run on liquid fuel. Therefore, switching to biofuels would be a very rapid way of affecting that economy and greenhouse gas production. The UK suffers from lack of tax incentive for the users to switch to biofuels and over-regulation by bureaucracies that cannot make decisions quickly.

7. Land Use

In the short run, oil seed rape is likely to be the crop used for diesel production and wheat for bioethanol production. Both of these are in widespread cropping already. There are other crops which may or may not be so attractive but could certainly be used. It could be arranged that there would be an increase in crop diversity by moving into biofuel productions. However, there is a more important matter which is only seen if the biofuels come from crops which are grown from waste. One of the effects of using compost on land, is that invertebrate populations rocket. This means that bird populations and diversity rise very noticeably. This has a knock-on effect on all biodiversity. So, provided the crops are grown from waste, there are some obvious advantages. These extend right across the rural environment. Proximity principle handling of locally produced wastes, can and does decrease tonne truck miles by between 65 and 85% compared with centralised processing.

8. Land Use

Import of anything has two significant disadvantages. Firstly, transport logistics not only cost money, they cost in energy use. Secondly, there is always the question of supply security, balance of payment and UK jobs. Home production, totally within the UK environment, is apparently much more attractive. It becomes really attractive, and dramatically so, provided waste is used to produce the crops for the biofuel production. It could also be used to eliminate Set Aside, which is a criminal obscenity.

9. What More Could be Done in Agriculture?

The answer here is really quite simple. What regulation has not done is recognise and harness the enormous amount of knowledge and sense of responsibility in the majority of farmers. One simple way of dramatically accelerating safe recycling to land would be to use a "driving licence" approach. This might involve allowing permissions to be very much more easily obtained within an agreed and simple framework. Then, if there was a breach of regulations, there would be 3-points on the "licence". If there were a level of pollution as a result, and these could be graded with a series of numbers of points, then getting to a total of 12-points would mean that the right to accept materials for recycling would stop instantly for a prescribed length of time. There has also been a principle of "polluter pays". There might also be a similar principle of "abuse loses privilege". It's a useful tool in motoring and our Environment Agency could easily apply spot-checks to make this work in recycling to land. Recycling high-volume, low-value waste can only logically and economically and sustainably be done to farm and forestry land. We need simpler, more enabling regulation with decisions that can be made rapidly by regulators. We also need composting standards which are related to use. It might well be that different waste could be taken to land used for biofuel production than for food production. It would not be difficult to define this sensibly with a technology-based programme. Within this framework, there is no particular reason to separate agricultural waste from waste from outside of agriculture; they are all potentially useful as fertilisers.

10. Learning from Other Countries' Experience

The UK is somewhere near the bottom of biofuel league tables of any developed country in the world. There are two factors in this. Firstly, the price at the pump affects what consumers buy. This is a very price-sensitive situation. Government taxation overseas does affect this particular factor. Secondly, the UK really does "gold-plate" regulation to the point of significantly reducing activities.

CONCLUSIONS

1. There is little doubt that there is a major opportunity here and also that is could easily be mishandled.

2. The opportunity could be very large, have a significant effect on the total UK and rural economies, and would be in public relations terms very attractive to the British people in general and government in particular.

3. Price at the pump really matters and this necessarily implies some government thinking on fuel taxation.

4. The Environmental arguments are dramatically more attractive if recycling waste to land to produce the crops to produce the biofuels is the route that is encouraged and developed.

5. The advantage will only come if regulation governing these activities is based on common sense, practical technology and speed in decision making.

Land Network International Ltd

January 2006

APPENDIX I

A Paper on "closed loop" sustainable fuel production

BIO-FUELS FROM WASTE

1. Bio-fuels from crops are certainly emotionally attractive as a "sustainable" fuel. The problem is that the environmental energy equations really do not stack up. However, that analysis is, as they say, strictly for the birds. Put waste instead of mineral fertiliser and the energy equations are dramatically different and compellingly attractive. We have to go down this route. However, to retain the advantage, there is a condition.

2. The technology to produce fuels from crops is certainly there. Some of it needs further development but there is no question that it can be done, producing bio-ethanol (substantial capital and running cost), bio-diesel (much more attractive), and bio-heating oils (most attractive). What crops do is harvest sunlight. The green material (chlorophyll) in leaves allows the crop to use the energy in sunlight to take carbon dioxide from the air and water through its roots to make sugars and oils. Those large carbon molecules can be used to make fuels. The process also takes carbon dioxide (one of the greenhouse gasses) out of the air. Sounds good and it does work. See Fig 1.

3. The problem with just crops-to-fuel is two-fold. Firstly, centralised processing of harvested crop products does lead to much trucking and the whole supply chain/process-logistics get complicated and expensive in energy. The second, and more dismissive, is that crops are conventionally grown with mineral fertiliser and the environmental energy equations are catastrophic. Firstly, the logistics of worldwide fertiliser manufacture and distribution were built in an era of low energy and transport costs. Secondly, and here is the fatal blow, mineral nitrogen fertiliser is made by passing air through an enormous electric arc which creates the temperature necessary to fuse the nitrogen in the air with the oxygen, thus making nitrogen oxides. So, the process is energy-based. In the world as it is, that electricity will almost certainly have been generated using fossilised fuel, probably oil or gas. Therefore, it would have been easier, and environmentally more attractive, to put the oil in the engine in the first place and not bother with going through the crop route. The fact is that, however it is looked at, this route is really not very attractive. See Fig 2.

FUNDAMENTAL CHANGE

4. It is not very difficult to see that if the crop is grown, not with "artificial" manufactured nitrogen, but with nitrogen from "waste", then the environmental energy equations become fundamentally different. They are attractive both in theory and in practice. We now have the classic problem-solving framework. Take a problem and find its mirror image and put them together. Just as in astrophysics we can contemplate taking a super nova and putting it with a black hole to get nothing, we can now take the quest for truly sustainable fuel and the need to "dispose" of "waste" and get the answer we are looking for. The links which solve the problem are a crop with a green leaf to harvest sunlight plus the technology to take plant oils and make fuels for engines and heating.

However, it is not quite as easy as that.

5. Take fig 3. All the advantages of crops to fuel are there but the main disadvantage of nitrogen fertiliser from fossilised fuel is replaced by nitrogen from waste. As the crop still takes carbon dioxide out of the air, this looks like the ultimate in sustainability. It basically is but mankind is in danger of making it difficult and introducing risks and losses. Consider the two obvious routes to production.

6. Firstly, bioethanol is relatively easy to produce from harvested crop products when the process is carried out in large, centralised factories. The large operation is at the centre of Western commercial thinking. Larger operations can be "efficient", use the latest technology, make a lot of money for a small group of people who can afford to take the risk, can be bought and sold by big business, are controllable by regulators and taxable by government, etc, etc.

7. Now consider small local operations where the waste at the base of the process is collected and used on a proximity basis. The national farmers' consortium, Land Network, has experience of decentralised operation of recycling waste to land. Their experience is that local operation reduces tonne-truck miles by between 65 and 85% compared with centralised operation. Now expand that into crop product processing and fuel use. The truth is that Western society has grown its industry, its housing-to-work structures, and its social attitudes on the motorcar and trucks but now things are different. There is a fundamental energy equation difference between centralised and proximity operation.

8. Forget, for a moment, the political correctness of Local Agenda 21 and the lip service paid to Proximity Principle operation. The truth is that small-scale operation necessarily means lower risk. If something goes wrong on a small-scale operation, then it is a small problem which is easier to police, control and correct. Secondly, with small-scale operation where the operator owns and lives on the site, there is a direct link between operation and responsibility. The fact is that on-farm composting and processing for local use is dramatically more attractive, *from an environmental energy point of view,* than centralised operation.

Bonuses

9. Looking back at Figs 1, 2 and 3, the basic logic is compelling. However, there is a bonus which the Figures also show. All of the carbon in the fuel produced from the crop comes from carbon dioxide in the air. The crop harvests the sunlight. The "waste" which is used as a fertiliser not only contains nitrogen, it is made up of large organic molecules based on carbon. In conversations with Professor Lynne Frostick, Head of the Waste and Pollution Research Centre, University of Hull, a figure of 100 million tonnes per annum of waste which could go to land, currently collected and put to landfill (which means that most of the cost is incurred) was, she thought, an underestimate. At that figure, the value in plant nutrients is somewhere in the region of equivalent to 60 to 100% of the value of mineral fertilisers used by farmers and mainly imported. That value approaches £1 billion per annum. The nitrogen fertiliser in that total is worth around £500 million and at least £200 millions worth goes straight into the groundwater when it rains. Waste to compost to farmland eliminates, repeat *eliminates*, nitrate pollution from this way of farming. (See other references provided.)

10. There is one more bonus and it is of global significance. That 100 million tonnes of "waste" would, if incinerated, produce probably somewhere around 75 million tonnes of carbon dioxide per annum—equivalent to 10% of the Kyoto Protocol estimate of UK total production of that green house gas. Recycle that "waste" to land and move to direct drilling will lock up probably 90% of the carbon.

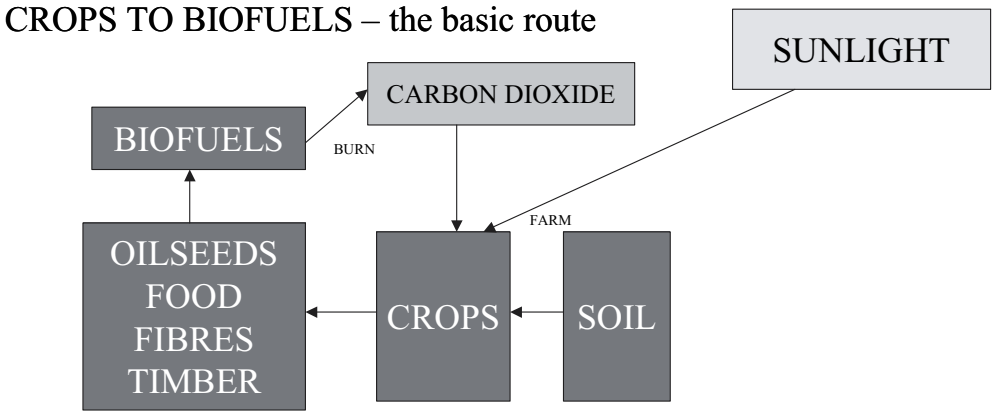
11. The fact is that recycling "wastes" to land, locking up the carbon, using the nitrogen in the compost to grow crops for bio-fuel production does make sense. Moving in the direction of "going organic" using wastes, preferably on a proximity basis, means that not only the farm goes organic, fuel production does too.

Global Significance

12. What all of this logic leads to is a conclusion of global significance. The logic of Fig 3 is compelling. For any particular "developed" country, the waste its society produces of the type which could go to land, would, if incinerated, produce usually many million tonnes of carbon dioxide per annum. However, recycle that "waste" to land and move to zero tillage, which will lock up probably 90 % of the carbon, use that soil for bio-fuel production and there will be a significant, national, net reduction in carbon dioxide production.

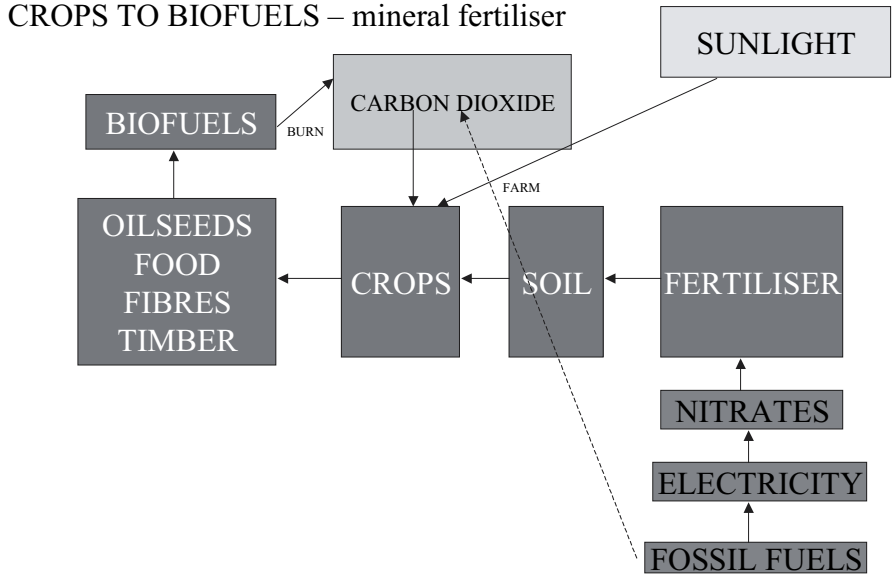
13. Do the figures stack up? Well, yes they do. The figures are the subject of a second paper by Bill Butterworth.

Fig 1. The basic equation of crops to bio-fuels. It looks really attractive. The crop uses chlorophyll to harvest sunlight. It is apparently actually sustainable.



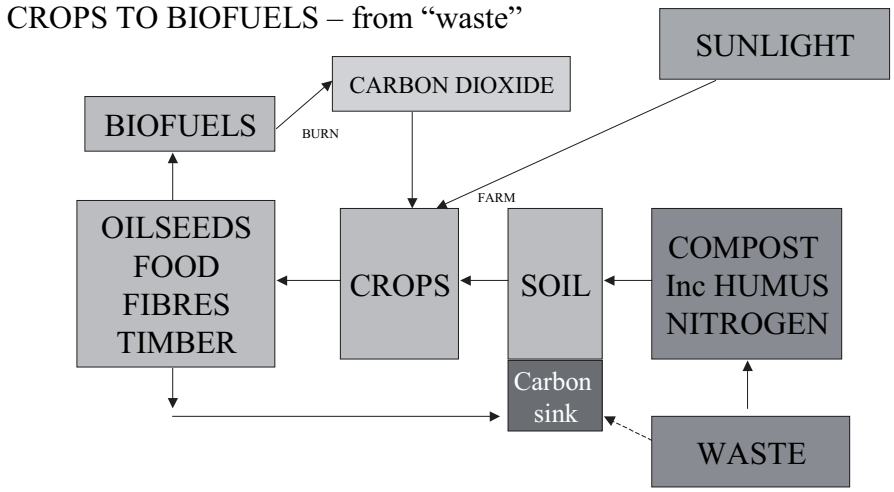
LAND NETWORK Fig 1

Fig 2. Take the basic crops to bio-fuel equation and add in where the energy to make the nitrogen fertiliser comes from and the advantage evaporates. Very large amounts of electrical energy are used to make nitrogen fertiliser. Further, the generation of power is usually based on burning fossil fuels; that produces more carbon dioxide.



LAND NETWORK Fig2

Fig 3. Substitute "waste" for manufactured nitrogen fertiliser by making compost on farms with lower trucking distances and the real advantage and true sustainability emerge.



LAND NETWORK Fig 3.

APPENDIX II

ISSUES REGARDING THE FEASIBILITY OF COMPOSTED MATERIALS FOR BIO-ENERGY CROPPING.

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1. As a strategy to reduce the usage of fossil fuels, there is increasing interest in renewable energies. Energies from biological derived materials (bio-energy) are becoming a credible option. Typically these materials are of plant origin either collected at source (primary) or as a by-product/waste from another processing industry/consumer (secondary/tertiary). Broadly, the materials are treated either via thermal-chemical conversion (combustion, gasification, pyrolysis) or biochemical conversation (digestion, fermentation) or in the case of oil seeds, direct extraction. After further modifications as necessary, these processes create either energy (eg, electricity) or a (bio-) fuel for energy (eg, biodiesel, bioethanol). In essence, all sources of bio-energy are carbon neutral, since the carbon dioxide produced is the same carbon dioxide fixed from the atmosphere during the growing season of the plant. The European Union (EU), has set targets that biomass derived energy should contribute almost 10% of the total energy supply by 2010 (Commission of the European Communities, 1997). Currently, about 1% of the total UK energy supply is supplied by renewable energy, with biomass accounting for about 60–70% (Faaij, 2006). While wastes play a major role, the UK aims for larger scale use of energy crops on a longer term as well (Faaij, 2006).

2. At the most fundamental level, crops are specifically grown for the production of bio-energy. However, there are doubts about the true environmental sustainability and credibility of this approach. One major concern is the use of inorganic nitrogen fertilisers during the crop production cycle. Nitrogen is the major essential plant nutrient. Approximately 50% of the total nitrogen used in agriculture is produced industrially using the Haber process. In this process nitrogen and hydrogen gases are combined together to form ammonia. However, the process is energy intensive. Thus, the true environmental cost and carbon footprint of specific bio-energy crops needs to take account of this when these fertilisers are used. However, replacing inorganic nitrogen with organic materials (compost) may resolve this issue. As a result of the Landfill Directive (see below), increasing amounts of composted materials, which contain plant available nitrogen, are currently being produced during the processing of waste organic materials. Thus, by linking current issues in waste management with energy policy, a more integrated answer can be achieved to address the problems faced by both sectors.

3. The Landfill directive [1999/31/EC] requires that the biodegradable municipal waste sent to landfill be reduced to 75% of 1995 levels by 2010, increasing to 50% by 2013 and 35% by 2020. To meet the Landfill directive, depending on the final definition of municipal biodegradable waste, anywhere between eight to 53 million tonnes of waste will need to be diverted from landfill by 2020 (The ENDS Report, April 1999).

Failure to meet these obligations could result in fines of upto £180 million per year. Composting is seen a viable route for much of the organic fraction. In the UK, the industry continues to grow. In 1998, only 0.9 million tonnes of waste were actually composted in the UK (Gilbert and Slater, 2000). This had increased to nearly two million tonnes by 2003 (Davies, 2003).

4. Composting is particularly attractive to the agricultural sector. Under exemptions from the Waste Management Licensing Regulations 1994, composting without licensing may take place where the waste is produced or where the compost is to be used. Thus, the majority (83%) of on-farm composting operations currently compost and dispose of waste under a waste management license exemption (Davies, 2003). As a result, agricultural applications represent the largest single outlet for composting activities. Economically, this route appears attractive since the composter collects a fee based on the amount received. The compost itself is of benefit as an improver of soil fertility both physical characteristics and nutritional value to crop growth. Since not all the carbon is mineralised on application to the soil, the soil acts as a carbon sink. Furthermore, the growth of an industrial crop, after compost application, is likely to reduce the risk of pathogens, hazardous to animal or human health, re-entering agricultural systems. Whilst technologically advanced solutions exist, many composting operations may be operated successful, if managed properly, using equipment and infrastructures already present on most agricultural farms.

5. The alternative to composting (accepting that landfilling is not an acceptable option) is incineration. Incineration of waste organic materials is as such a tertiary source of bio-energy (see above). However, many organic wastes have high moisture contents and are therefore not particularly amenable to incineration. Incineration facilities have a high capital investment cost. This results in incinerators being large and centrally situated. This contributes to their major drawback in that their perception socially, is low, particularly with local residents (nimbyism) whose concerns centre around their potential hazard to human health.

6. To comprehend the full impact of linking these issues requires extensive study. Figure 1 addresses the stages (and some alternatives) to how recycling of organic waste to land for bio-energy production would be achieved. At each stage, considerations regarding the issues of political, regulatory, social, economic, energetic, and technological feasibility need to be assessed to create a complete life cycle analysis. It is unlikely that "one solution" exists. It is more likely that the "overall solution" will be a series of individual solutions that will involve a range of technologies dependant on local and specific circumstances.

7. Research suggests that the potential surplus land in the EU is capable of producing 20–40% of the energy supply (WRR, 1992). Crops for biofuels is of obvious potential, yet their uptake in the EU remains low. For example, although the EU is the world leader in bio-diesel production, the current contribution of all biofuels to total bio-energy production is almost negligible (van Thuijl *et al*, 2003). EU production of bio-ethanol, the other major biofuel, is less than 2% of total global production. Even so, within each of these sectors significant increases in production are being seen within the EU (Faaij, 2006).

8. In summary, the combination of composted organic waste with the production of industrial crops intended for energy shows immediate promise. Furthermore, the situation is likely to become more attractive as energy demand (and cost) increases, and political/legislative decisions favour both compost production and renewable energy production.

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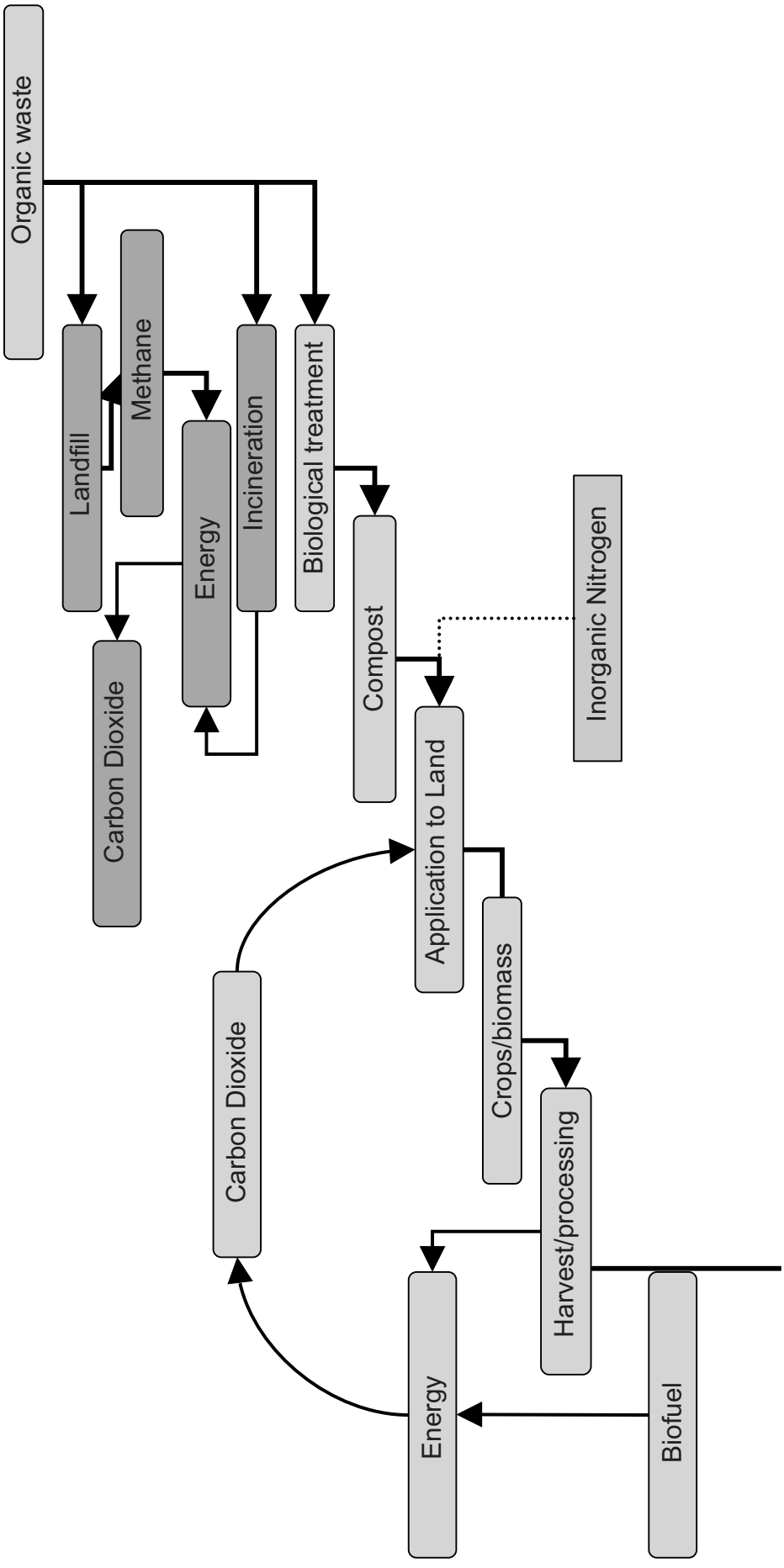
Figure 1. Schematic showing the route of organic waste to compost to energy. The input of compost replaces the input of inorganic nitrogen at the application to land step. The alternatives for disposal of organic waste (landfill and incineration) are also shown.


Organic waste
Landfill
Methane
Energy
Incineration
Biological treatment
Carbon Dioxide
Compost
Inorganic Nitrogen
Application to Land
Carbon Dioxide
Crops/biomass
Harvest/processing
Energy
Biofuel

Memorandum submitted by Renewable Energy Foundation (Bio 03)

INTRODUCTION

1. Renewable Energy is widely believed to have a significant role in tackling climate change. However, the Renewable Energy Foundation judges that the extent and character of this role is often misunderstood, even in governmental circles, with the result that policy is structured around expectations which are both unrealistic and likely to encourage deployment of renewable energy in ways which are sub-optimal. We conclude that analysis drawing upon the experience of our European neighbours, who have made extensive experiments aimed at reducing emissions via the means of renewable energy technologies, leads to the view that, amongst several other misapprehensions, bioenergy's role has been incorrectly evaluated.

2. The Foundation has argued for this view in a detailed submission to Sir Nicholas Stern's review of Climate Change Economics[1] and we refer the Committee to our submission to that Inquiry.[2] In this introduction we summarise and draw on that thesis as a necessary context for the brief responses to the Commitee's 10 questions, which conclude this document.

3. As part of its submission to the Stern Review the Foundation commissioned a report from one of Germany's leading energy analysts, Dr Wolfgang Pfaffenberger, Professor of Economics (European Utility Management) at the International University of Bremen, and Director of the Bremer Energie Institut.[3] Professor Pfaffenberger indicated that German endeavours with regard to emissions reduction, particularly via renewable electricity, have been unsatisfactory in a number of regards, a fact which is now increasingly widely recognised in Germany itself.

4. The four main conclusions of Professor Pfaffenberger's study may be summarised thus:

(i) Subsidy support for renewable technology in Germany has encouraged the production of renewable energy, but it has sheltered renewables from the disciplines of the market, resulting in unbalanced development. In Professor Pfaffenberger's words:

> *To promote market introduction would require that renewable energy producers regularly become responsible for marketing their product by themselves. It would require that they produce the balancing services necessary for a marketable product and combine these services with their renewable product. The present system is clearly a system where the renewable energies are outside of the market whereas on the other hand of course they influence the market.*

5. We believe that this comment applies with equal force in the United Kingdom, where the Renewables Obligation has the superficial appearance of a free market instrument, but has created an artificial, indeed a "hothouse", situation, with all the undesirable results that such a forced growth entails.

(ii) Renewable electricity is, relative to other means, an expensive method for the reduction of greenhouse gas emissions. (We note that this empirical experience confirms the findings of the National Audit Office report on *Renewable Energy* published earlier this year,[4] and also endorses the views expressed in the House of Lords Report, *The Economics of Climate Change*[5]) Professor Pfaffenberger writes:

> *Whereas the promotion of renewables in Germany was definitely effective in the sense of increasing capacity and production it was certainly not cost effective in the sense of getting the highest effect per Euro in terms of greenhouse gas reduction or production from renewable sources.*

This is a very important conclusion.

(iii) Because of difficulties in balancing the grid due to the presence of stochastic wind generation Germany is now faced with the need for costly and largely unanticipated measures to ensure stable supplies. These increases in cost have implications for industry, as Professor Pfaffenberger indicates:

> *A system of national support for renewable energy in the way the German system has been designed definitely changes the competitive position of any industry that works for the international market.*

6. There is no compelling evidence that the situation in the United Kingdom is significantly different. Indeed, in-so-far as the UK's grid is islanded, as opposed to being richly interconnected as is the case in Germany, balancing problems and associated costs are more probable here (for comments on this matter we refer the Review to the articles by Hugh Sharman in *Civil Engineering*,[6] discussed below). Furthermore,

[1] http://www.hm-treasury.gov.uk/Independent_Reviews/stern_review_economics_climate_change/sternreview_index.cfm

[2] The document is available from the Foundation's website: http://www.ref.org.uk

[3] http://www.iu-bremen.de/directory/02826/

[4] National Audit Office, *Department of Trade and Industry: Renewable Energy*, report by the Comptroller and Auditor General, H 210 Session 2004–05, 11 February 2005. Available from http://www.nao.org.uk/

[5] House of Lords Select Committee on Economic Affairs, *The Economics of Climate Change*, 6 July 2005, Chaper 5.

[6] Hugh Sharman, "Why Wind Works for Denmark", *Proceedings of ICE: Civil Engineering*, 158 (May 2005), 66–72; and "Why the UK should build no more than 10 GW of Wind Capacity", *Proceedings of the Institution of ICE: Civil Engineering* 158 (November 2005), 161–169.

in some respects the regulatory framework in the UK is less favourable to industry. For example, Professor Pfaffenberger writes that while intensive energy users in Germany are granted partial exemption from the impact of renewable energy laws, cost increases have still resulted in a crisis in these industries. In the United Kingdom, of course, far from being sheltered to any degree, industry is exposed to increased costs via both the Climate Change Levy and the Renewables Obligation.

(iv) The introduction of renewables has not necessarily had a positive net effect on the economy. In a crucial passage Professor Pfaffenberger writes (the emphasis is ours):

> *Part of the motivation for promoting renewable energy is to substitute local generation for imported energies and in this way promote economic activity and employment. A number of studies have been carried out during recent years to investigate the effects of the promotion of renewables in this respect.*
>
> *The results are not very encouraging (see Häder, 2005 and Hillebrand, 2005). Basically, of course, investing in renewable energy plants creates employment in industries producing these investment goods. On the other hand the extra cost of renewables adds to the cost of energy and in this way destroys purchasing power that otherwise could have created demand and indirectly employment in other areas.* Whereas the gross effect of spending money on renewables is always positive, the net effect may be negative.

7. We draw attention to this last point because it bears with considerable weight on the way in which the United Kingdom conceives of renewables within its climate change policy. Any climate change policy which is economically deleterious for the proposing state will actively discourage emulation at international level, and will thus fail to contribute to climate change mitigation, since it is only by carrying the developing world in the direction of lower emissions that a domestic policy can achieve significance. The United Kingdom emits roughly 550 million tonnes of CO_2 per year.[7] This is roughly 2% of the global total of 24,000 million tonnes.[8] It should be immediately apparent that the United Kingdom has no effective quantitative role in global climate change policy, but instead can only contribute by:

— Demonstrating and exporting good practice.

— Providing an economically compelling example.

8. Rapid growth in the developing world further emphasises this point, and may be conveniently indexed via electricity. China is at present approximately five times the size of the UK electrically, with an installed capacity of roughly 357 GW, generating approximately 1,800 TWh.[9] The UK has an installed capacity of roughly 74 GW and generates around 400 TWh per year. By 2020 it is estimated that China will need to generate some 11,000 TWh, with an installed capacity of approximately 2,400 GW.[10] In other words, by 2020 China will have grown sixfold electrically and be some 30 times the size of the UK in this sector. While nuclear and hydro-electrical power will provide a considerable portion of this energy, the bulk is expected to come, necessarily, from coal and gas.

9. Seen against such a backdrop, it is obvious that the United Kingdom climate change and energy policies will be at best futile unless they are economically attractive and sufficiently practical to induce emulation in China, and elsewhere. Consequently, as we have emphasised in our 2005 Manifesto,[11] it is essential to recognise that the goals of the 2003 Energy White Paper must be prioritised correctly, even though this resequencing may seem counterintuitive.

10. It is widely agreed that energy must demonstrate favourable credentials in a number of areas, and ideally should be:

— Secure.

— Reliable.

— Economical.

— Clean.

— Sustainable.

11. However, it should be noted that these are qualities which should be characteristic of the overall energy portfolio. It is not enough that the various component technologies of our portfolio should demonstrate them individually. Each technology must manifest these qualities in such a way that:

— The ability of other technologies to deliver their benefits is not impaired.

— The value of the energy sector as a whole is not seriously compromised.

12. We suggest that the criteria should be arranged in the sequence given above, reflecting their priority and consequence. The logic of this sequence can be explained as follows:

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[7] For latest emissions data see DEFRA:http: //www.defra.gov.uk/environment/statistics/globatmos/gaemunece.htm

[8] Current estimates can be obtained from the Energy Information Administration of the US Dept of Energy: http://eia.doe.gov/

[9] See International Energy Annual data on: http://www.eia.doe.gov/emeu/iea/

[10] See statements by Zhang Guobao, vice-minister of the National Development and Reform Commission quoted in the *China Daily*, 19 October 2004: http://www.china.org.cn/english/BAT/109757.htm

[11] Manifesto 2005, *Renewable Energy—the Need for Balance and Quality,* Published by the Renewable Energy Foundation, January 2005.

— If security of the primary sources cannot be guaranteed, then reliability at the point of use is questionable.

— If security and reliability of supply are compromised, then our economy will be damaged.

— If our energy supplies are insecure, unreliable, and unaffordable we will be unable to maintain and develop the high technological economy necessary to support our social aims and control the emissions of a large urban and industrial society.

— If the energy system in its total sense is unclean, as is seen in the CIS countries and parts of the developing world, then our social aims will be compromised by ill health in our population.

— And finally, if we cannot achieve any of the foregoing aims, our overall energy policy will be unsustainable, and the well-being of the United Kingdom and its people will be poorly served in the short, medium, and longer term.

13. This sequencing and logic differs radically from that found in the *Energy White Paper*, which we believe is gravely and dangerously flawed.[12] In particular we note that the *White Paper* foregrounds emissions abatement as the principal goal, and allows other goals to settle into subordinate positions in no particular order. In criticising this policy framework the Renewable Energy Foundation is not suggesting that emissions abatement is unimportant, but, rather, that placing it centre-stage is likely to compromise our ability to reach other essential objectives.

14. In the light of this we are drawn to conclude that the Renewables Obligation has created sub-optimal investment patterns in renewable technologies, and that significant revision, learning from the experience of Germany and Denmark, is required. We refer the Committee to the many publications from Denmark and Germany now confirming that wind energy is at best a fuel saver, and offers only a very low "capacity credit" (the ability to replace "firm" capacity in the portfolio). We recommend that the Review is mindful of both the E.ON Netz *Wind Report 2005* and the recent articles in *Civil Engineering* by the leading energy consultant, Hugh Sharman.[13]

15. From these documents, and from Professor Pfaffenberger's report for us, we conclude that the UK's current policy is heavily over-dependent on wind energy. This imbalance is largely the result of the simplistic structure of the Renewables Obligation, which is "unbanded", and makes no distinction between the manifest merits of various technologies. The consequence has been an investment scramble for the least capital intensive ticket to the RO subsidy stream (initially land-fill gas, now wind), regardless of the intrinsic value of the technology adopted. This is doubly unfortunate, since the overemphasis of one technology has resulted in the neglect of others, such as tidal and bioenergy systems, which have more offer in terms of secure and firm energy provision. While wind power will undoubtedly form part of the UK's future portfolio, the current levels of proposed development, particularly in Scotland and Wales, are, from a national perspective, irrational and do not constitute a wise use of scarce capital.

Conclusion

16. From the above analysis we conclude that there is no *necessary* conflict between the two major goals of any UK energy policy:

— Configuring energy provision to serve our own economic needs.

— Fulfilling the United Kingdom's international responsibilities in relation to climate change.

17. Indeed, if the energy policy promises economic disadvantage it will by the same token be ineffective as a climate change policy because it will fail to carry the developing world in the same direction. Thus, we conclude that:

> *Economic viability and attractiveness is the first and fundamental test of any climate change policy for the United Kingdom.*

18. Considering the Committee's questions against this backdrop we reach conclusions that may vary from those obtained from other sources.

[12] See, for example, *Energy White Paper: Our Energy future: Creating a Low-Carbon Economy* (Dti: London, 2003), pp 7ff.

[13] REF's abstract of the E.ON report is available from www.ref.org.uk, and the full report http://www.eon-netz.com. Hugh Sharman's papers, "Why Wind Works for Denmark", *Proceedings of ICE: Civil Engineering*, 158 (May 2005), 66–72, and "Why the UK should build no more than 10 GW of Wind Capacity", *Proceedings of the Institution of ICE: Civil Engineering* 158 (November 2005), 161–169.

RESPONSE

19. In order to facilitate reference we preface each response with the full question as given in the Committee's call for evidence.

Q1. *What is the real scope for biomass and biofuels to contribute to tackling climate change? What proportion of the UK's energy and transport fuel needs could they provide?*

20. As noted, the UK, overall, has no significant quantitative scope for tackling climate change, and we are consequently concerned that the rider question here embeds the false assumption that the UK can in fact contribute quantitatively. Bearing in mind our analysis above, we note that:

(i) Biomass is not only capable of reducing emissions but also of contributing firm capacity to the electricity generation portfolio of the UK and thus strengthening its grid. Thus although its potential proportionate contribution to the UK's electrical energy needs is modest, because of landmass limitations, this is still a potentially and economically attractive example to other regions of the world where land is less of a limiting factor.

(ii) Biofuels, both biodiesel and bio-ethanol, can reduce dependence on imported hydrocarbons. It is feasible to supply 5% of the UK's current petrol consumption from existing domestic surplus food grains, without additional planting. This is a real contribution, and can offer an economically compelling example by maintaining agriculture in a healthy condition, and reinforcing the UK's ability to cultivate a proportion of its own food needs.

(iii) Biogas production has some scope in the United Kingdom, in both rural and urban areas, for heating and other uses not requiring high compression, and effective demonstration and innovation here could stimulate wider and more efficient applications in the developing world.

Q2. *How cost-effective are biomass and biofuels in comparison with other sources of renewable energy?*

21. Simplistic calculations may be offered to the Committee suggesting that biomass and biofuels are costly, relative to other renewables. However, the truth is that all renewable energy sources struggle to be competitive when compared to conventional alternatives, and thus require subsidy support. However, these renewable technologies are not equal in intrinsic merit, and thus, this question needs to be understood as asking "How do the merits of biomass, biofuel and other renewable energy technologies rank in deserving subsidy support?"

22. Due to the potential for "firm" generating capacity evidence by biomass, and the obvious merits of biofuel and biogas, we submit that organic energy has a very high merit rating in spite of any scalar limitations.

Q3. *How do biofuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?*

23. Life-cycle emissions budgets for biofuels for transport and biomass are contentious, and heavily dependent on the farming styles assumed, but similar doubts exist with regard to the currently accepted life-cycle emissions calculations available for other technologies. For example, there is genuine and deep uncertainty with regard to the actual savings arising from the introduction of stochastic renewable electricity generation. Comparisons between biofuels, biomass, and other renewables are thus inconclusive in terms of scale. However, we can be certain that neither can offer scope for quantitative savings comparable to that available from clean generation in the conventional sector, via, for example carbon-dioxide capture and sequestration. While this is an important consideration and, particularly so since the developing world is certain to derive much of the energy it requires from fossil sources, it also serves to remind us that the UK should not be looking to renewables for bulk savings. In short, we feel that this question is insufficiently subtle in its framing. Instead, it would be more profitable to ask whether biofuels, biomass, have acceptable carbon balances, promising economics, intrinsic technological merits (storable energy, firm generation), and scope for application in the developing world. The answer to all these questions is positive.

Q4. *Not all biomass is equal — potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?*

24. Intensively cultivated wheat fields may currently call for as many as 10 to 20 separate tractor passages in a season, but bioenergy crops do not require such attention, largely because there is real potential for significant reduction in the use of fertilisers and pesticides. The greatest threat to attainment of these desirable goals lies in the nature of the subsidy support mechanism, which could very easily, if great care is not taken in its design, simply act to encourage energy intensive farming to maximise subsidy share. Avoiding this flaw, without removing the incentives for effective farming, will be no trivial matter.

Q5. *What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and biofuels?*

25. The regulatory regime is crucial to adoption of biomass and biofuels. In the area of biomass for electricity it is imperative, as REF has argued repeatedly, that the Renewables Obligation is revised so as to recognise the intrinsic merits of firm renewables, and that thus more will be offered to those technologies which have more to offer.

26. In relation to biofuels we recommend that duty be waived provided that the feedstock is grown in the British Isles. We are aware that this may present legal problems, and charges of protectionism, but simple duty breaks are likely to encourage imports of organic feedstock, or of processed biofuels, thus defeating the object of enhancing security of supply and reducing emissions.

Q6. *What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?*

See our response to question 5 above.

Q7. *What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?*

27. There is some anxiety amongst the public that energy crops might increase the trend towards a narrow range of crop types, with all that this implies for wildlife. However, this need not be the case; indeed, with bio-ethanol it is clear that the growth of feedstocks for this product would encourage the re-adoption of traditional rotation patterns, and if conducted correctly reduce the use of herbicides and pesticides, a combination that could, with adequate management, be positive for biodiversity and the general environment.

Q8. *Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?*

28. Opportunities for non-food crops in the UK are not numerous—timber is practically the only serious alternative—and it is unlikely that bioenergy projects would interfere significantly with this use. Indeed, with careful management it is possible that the introduction of energy crops in tandem with other projects could enable the viability of some timber forests that would otherwise be uneconomic.

29. It is our view that the benefits of bio-energy are to a large degree dependent on the domestic origin of the biomass or feedstock. The underlying reasons for this, in order of significance, are:

(i) Security of supply.

(ii) Economic benefits to agriculture, enhancing food security by supporting the sector.

(iii) Benefits (i) and (ii) above combine to constitute an economically compelling example to the developing world.

(iv) Energy required to import materials may negatively affect the overall emissions budget of the organic energy produced.

Q9. *What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?*

30. It is the Foundation's view that energy from waste is an area which might benefit from special support since it is potentially "firm" and has other aspects offering social utility. Agricultural and forestry waste are a sub-category of waste, and are generally speaking, fall readily into the "renewable" category. Special support for "renewable" waste could therefore be provided by modifications under the Renewables Obligation.

Q10. *What lessons can be learned from other countries' experience in the production and use of bioenergy?*

31. German and Danish experience leads us to conclude that:

(i) We must be realistic about the scale of biomass and biofuel production, particularly in a small landmass such as the United Kingdom. While the potential is real, it is limited and consequently must not be oversold for political reasons. Due to exaggerated claims with regard to renewables the educated public is increasingly wary of claims tinged with salvationism, and over-forceful marketing may stimulate rejection.

(ii) The viability and appropriateness of biomass for electricity is crucially dependent on the correct scaling of the project. Our view is that larger scale biomass generators (say 20 MW and upwards) are unlikely to be suitable for broadscale application, due to fuel demand and consequent vehicle

movements. Justifiable public opposition is likely in such cases. Smaller units, however, may find a niche and offer compelling benefits to the areas in which they are situated, especially when seen as part of an integrated demand-side management package.

(iii) Biomass for electricity should wherever possible be designed as CHP to ensure adequate economics (this point can be confirmed by examination of those biomass projects currently operating in the UK).

(iv) While the clear and immediate application for bioethanol and biodiesel is as transport fuel, thus enhancing security of supply and reducing emissions, in the future it will be increasingly desirable to look at non-transport applications.

Renewable Energy Foundation

January 2006

Memorandum submitted by Natural Systems Limited (Bio 04)

1. Re item 9: "What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?".

2. Agricultural and forestry organic waste is a low-density energy resource and is often widely distributed and of variable composition. These factors militate against transporting these wastes to a central waste-to-energy station. (An exception to this is found with municipal solid waste collected from large conurbations with a large organic content.)

3. Organic waste is, excluding woody waste from forestry, ideally suited to anaerobic conversion into biogas and a solid digestate, which is a valuable soil conditioner able to return valuable nutrients back to the land.

4. An entry in the New Spirit Challenge competition run by the IEE in 2003 was won by an entry from New Zealand for a fully integrated energy system for dairy farms. This described how cowshed effluent could be used to generate biogas with a high methane content, and for this gas to be used on-site (not stored or compressed). The biogas is used continuously as the fuel in a combined heat and power (CHP) system. The energy of the biogas is converted and stored both as hot water, for hygiene purposes in the dairy milking plant, and as ice, for cooling a dairy herd's milk output. The idea is the subject of a patent filing by Natural Systems Limited.

5. UK dairy farming can use this system to reduce its energy costs and deal with manure and bedding material in an environmentally sound manner. Its practice will return valuable organic fertilizer to the land without broadcasting obnoxious odours, or the danger of effluent runoff polluting waterways from raw effluent (muck spreading).

6. A dairy farm can take in additional agricultural waste from neighbouring farms where the transport distance is not too great. On farms where there is no requirement for heat or cooling the CHP system can deliver electrical energy into the local distribution network. The surplus low-grade heat, after meeting the requirement to maintain the anaerobic digester at its operating temperature, can be dumped if it cannot be put to a useful purpose.

7. This system provides a low cost system that could be replicated in high volumes helping farmers realize value form their slurry and other wastes. Support for early deployments of this technology will help make the systems financially viable, this support will not be required when the number of installations increases; as the industry will benefit from reduced costs due to the volumes.

8. Today slurry disposal is an overhead on the farming business and can cause considerable environmental damage if it is not handled correctly. It also helps reduce the emissions of methane gas by farms, methane is a green house gas 23 times more damaging than CO_2.

Natural Systems Limited

January 2006

Memorandum submitted by Energy for Sustainable Development (ESD) Ltd (Bio 05)

1. You ask for evidence on a number of points. As an active developer of energy crop projects for a number of years Energy for Sustainable Development (ESD) Ltd has a specific view on many of these points.

2. The basis of this view is that biomass allows us to harvest, and use, atmospheric CO_2 as a sustainable form of carbon energy in preference to mining fossil reserves. On a large scale it is part of a national carbon/CO_2 solution, as well as a local "stored sunlight" renewable energy option.

3. Nature does part of this for us work through "free" photosynthesis, but we have to do the rest as biomass is not a very amenable fuel. This makes biomass expensive, and it has been easier to live cheaply on the planets' energy "capital". This is not sustainable as:

— fossil resources are finite;

— using the atmosphere as a CO_2 sink is risky; and

— we should be learning to live within our means.

4. In the UK none of these arguments is particularly compelling:

— we have (had) plenty of coal, oil and gas;

— we may benefit from global warming (if the sea does not rise too much); and

— we are dedicated consumers, and need growth to drive the service economy.

5. To comply with out Kyoto commitments, and to have more sustainable development, we should be thinking about changes to the nature of our enterprise economy—and in particular the role of farming, and the way we use land.

6. Without CAP subsidies, food production in the UK could have declined rapidly, possibly even disappeared, and we might have returned to the high levels of pre-industrial forest cover normal in a temperate zone climate. In a carbon constrained world this additional carbon sink would have been welcome, and this may still happen if we can find an income for the land owner/land user while this sequestration is going on. Public subsidy has been the traditional answer, but it does not always stretch far enough.

7. The high quality fuel withdrawn from this new sink would be "carbon neutral". However, tree growth rates are low, income is slow to arrive, and clear fell is not appreciated by the public. The alternative could be faster growing standing crops producing a lower quality fuel, earlier income and more sympathetic harvesting. If the revenue streams, currently generated and traded amongst the large energy users, filter down to the growers then this type of carbon farming/CO_2 recycling becomes practical.

8. The growers will face competition for this money. We expect to see the emergence of technologies enabling the economic long range import of low carbon biomass fuels. The palm oil industry in Malaysia is seeing this now as the transport sector of the international energy market is, without any carbon credits, willing to pay more than the food industry for raw vegetable oil to make biodiesel. Other road fuel products, bioethanol, and pyrolytic bio-oil, will not be far behind biodiesel.

9. The arrival of this purchasing power is going to have an interesting effect on land use patterns etc both here, and in developing countries. The environmental and economic exploitation that has been seen around the charcoal fuelled cities in tropical climates could be about to go global.

10. For the UK we would like to ensure that:

— this new demand for a cultivated carbon crop is met sustainably;

— that a significant part the crop value is passed through to the land user; and

— that the land owner benefits.

11. The alternative could be contract farming (land mining, in effect) by large corporate entities with genetically enhanced crops eg soya in S America, in a way that is embarrassing even for the old Plantation companies.

12. In our view sustainability would be encouraged if the land owner could acquire the capital to come part way (or all the way) up the value chain to supply the energy market directly. The decisions that are then made about land use, both here and in developing countries, would be more supportive of the rural inhabitants, the land users, and the local ecology.

13. The carbon emission values equivalent to £20/ton of biomass generated within the EUETS could be used to replace the CAP subsidy and make low input, long output woody energy crops such as willow, miscanthus etc viable without public subsidy. If too much of this revenue is attracted across to high input, short output crops like cereals and oil seeds, that can be easily imported, then the opportunity to optimise domestic carbon savings for a low CO_2 future from changes in land use could be lost.

14. From this perspective:

I. *The "real" scope*: 1m ha producing 4mtoe—2.5% of current primary energy needs. 4% if we can get national fuel requirements down to 100mtoe/yr.

II. *Cost effective*: Field biomass costs £40/odt without any subsidy. It could be delivered at less than £100/odt—£20/MWh, which is the current price of domestic gas, and less than the price of heating oil. It is the cheapest renewable fuel.

III. *Carbon savings*: Carbon farming with low input crops has an energy ratio $>20{:}1$ making it virtually carbon neutral. Sequestering and re-using atmospheric CO_2 on 1m ha could save 2.5mtC/yr if it replaces gas, more if it replaces oil and coal.

IV. *Sustainability*: The focus must be on the carbon saving achieved, not the "renewable energy" produced. Standing, low input woody crops in preference to intensive arable crops.

V. *Impact of Government actions*: The key to progress is Government action to release land for carbon farming and wind farming by adjusting land use policies.

VI. *Support needed* : Biomass requires a stable, long term investment climate to attract the capital needed for the new infrastructure. 50% of this needs to come from individual consumers (via the RO), or the Treasury (as capital grants) where the carbon avoidance costs are reasonable (< £70/tC).

VII. *Impacts*: the 1m ha should be reasonably distributed, and will then contribute to biodiversity and sit comfortably alongside food farming.

VIII. *Comparative advantage*: we will also import low carbon biomass. Eventually domestic carbon farming will need to be limited to protect food production.

IX. *By-products*: there needs to be more creative investment in the supply chain. This will come as new harvesting/processing technologies are developed by the Finns, Swedes and others with a more serious approach to biomass.

X. *Lessons learnt*: we do not need bioenergy—we do not have enough non-food land to make a real difference. However, in proportion to what we have, we do need to be serious about carbon farming and sustainability. Other countries show that Government action must be firm and committed. An RO to 2027 is not enough. An RTFO that does not have permanent tax breaks, is not enough.

15. The Treasury must think beyond the £ as a petro-currrency. Stripped of fossil fuel resources the UK needs to become a low energy, low carbon economy quite quickly, and for this to happen we need to go carbon farming, as well as wind farming.

Energy for Sustainable Development (ESD) Ltd

January 2006

Memorandum submitted by the Energy Saving Trust (Bio 08)

1. The Energy Saving Trust plays a leading role promoting energy efficiency and renewables to the domestic household sector, and promoting cleaner fuels and vehicles to the business transport sector. Given this remit, we have only responded to questions where we believe we can add value.[14] This response should not be taken to represent the view of Energy Saving Trust members.

Q1. *What is the real scope for biomass and biofuels to contribute to tackling climate change? What proportion of the UK's energy and transport fuel needs could they provide?*

2. The UK has the *theoretical* potential to provide a large proportion of household heating and transport fuel from home-grown biomass (heat and electricity) and biofuels (transport). There are numerous studies that have explored this potential (see Appendix—Bibliography). More important is the question of how to deliver a sufficient proportion of this potential to the market.

3. For transport, duty rate differentials have sparked the market to some extent, but could never deliver mass uptake of biofuels, because car manufacturer will not honour UK warranties if biofuel blends greater than 5% are used, and the tax reduction applies only to the bio-component, so the actual price difference due to the tax break is negligible. Higher-percentage petrol-ethanol blends can be used, as they are in Brazil and Sweden, but these require custom-made vehicles and new fuel infrastructure. The *practical* carbon reduction potential from biofuels in the short to medium term is around 1 million tonnes of carbon dioxide per year in 2010, which will be delivered when the Renewable Transport Fuel Obligation is fully phased in (the RTFO will likely be set at 5% by 2010: the carbon saving depends on how the biofuel is produced—see question 4 below).[15]

4. In the domestic energy and heat market, our modelling shows that domestic biomass heat has strong carbon and cost saving potential when used to replace off-grid LPG and electric heating. With appropriate support, we estimate that biomass heating could reduce household carbon emissions by 3% or around 720,000 tonnes (Energy Saving Trust 2005).[16] Research for Carbon Trust and DTI concurs that the best next step for small-scale biomass in the UK is in small-scale heat applications, with switching from oil-fired boilers currently the most cost-effective application (Carbon Trust 2005; DTI 2005) However, uptake of Biomass in domestic applications is low—just 150 installations of biomass pellet boilers in the entire UK (Energy Saving Trust 2005).

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[14] The Energy Saving Trust was set up by the Government following the 1992 Rio Earth Summit and is one of the UK's leading organisations addressing the damaging effects of climate change. Energy Saving Trust's goal is to achieve the sustainable and efficient use of energy, and to cut carbon dioxide emissions, one of the key contributors to climate change.

[15] CO_2 savings from DfT—see http://www.gnn.gov.uk/environment/fullDetail.asp?ReleaseID = 177217&NewsAreaID = 2&NavigatedFromDepartment = False

[16] See http://www.dti.gov.uk/energy/consultations/pdfs/microgeneration-est-report.pdf

5. At time of writing (January 2006) the ClearSkies grant scheme was still offering grants incentives for householders to install biomass boilers (and other Microgeneration technologies). This programme will soon close down to be replaced by the forthcoming DTI Low Carbon Buildings Programme[17] include actual link to dti website in footnote Grants or other incentives are required to boost the market for biomass boilers: persuading off-grid householders using LPG or electric systems to switch to biomass poses significant challenges, and indeed a key recommendation of the Biomass Task Force[18] is for a continuation of such grants.

6. Other options to increase the uptake of biomass energy are district and community heat and power schemes are co-firing in existing power stations, and new build. Energy supply issues are outside Energy Saving Trust's remit, so we do not comment here on co-firing. We do play a leading role in developing community heating, however, through the Community Energy programme we manage for DEFRA, which includes a number of biomass heating projects.[19] New housing developments in rural areas also offer opportunities to promote biomass energy as does the EU Buildings Directive, which requires developers to show that renewable heating has been considered for buildings with a floor area greater than 1000m^2. Measures to help access this potential are required.

7. A significant future opportunity for biofuel/biomass development is Biogas, particularly in transport, where this is an almost completely untapped resource. Currently all the usable biogas generated in the UK is used to substitute for natural gas in local households—and a number of projects in our Community Energy programme use waste from landfill gas. However, the biogas could potentially be used as a transport fuel, if the fuel is sufficiently compressed and treated, and used with vehicles modified to take compressed gas fuel. The Biomass Task Force report asks Government to explore the potential for Biogas as a road fuel, and we are also aware of an independent study currently underway by looking at the potential for Biogas. There are questions around how to build Biogas into the RTFO requirements, and we would urge the EFRA Committee to make the potential for Biogas in transport a central part of its investigations.

Q2. *How cost-effective are biomass and biofuels in comparison with other sources of renewable energy?*

8. Various studies have sought to answer this question. A good source for biomass is the DTI Renewables Innovation Review,[20] while the leading study for transport is the CONCAWE Well-to-Wheels Study[21] (which also compares biofuels with fossil-fuels).

Q3. *How do biofuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?*

9. For biofuels, we suggest reference to the CONCAWE report noted above.

Q4. *Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?*

10. There is a large body of literature on life-cycle assessment of energy crops (see Bibliography). The Low Carbon Vehicle Partnership has shown that by varying various parts of the production chain, carbon savings from Bioethanol compared to fossil petrol can be as low as 7% and as high as 77% (LowCVP 2004). For transport it is imperative that a carbon and sustainability assurance scheme be built into the RTFO as a safeguard to the environmental integrity of potentially large quantities of imported Biofuels to the UK. Work designing a model for assessing the lifecycle environmental impacts of Biofuels is underway.

11. The efforts to promote biomass in the UK have also sought to avoid "sucking in" unsustainable imports, by requiring local production of fuel stocks, and in Scotland there is a large domestic wood resource for biomass heating. The combination of locally sourced fuel and low market uptake means that sustainability issues are less of a problem in the biomass sector. Energy Saving Trust has no expertise in farm biodiversity, so does not comment on the direct conservation and biodiversity issues with energy crops.

Q5. *What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and biofuels?*

12. The EU Biofuels Directive had a limited impact in the UK for several years. There were no serious moves to introduce an RTFO in the UK until an Enabling Amendment was inserted into the recent Energy Act in the House of Lords, primarily as a result of strong campaigning. Until that time the UK had simply

[17] See http://www.clear-skies.org/. The new Low Carbon Buildings Programme is due to launch in April 2006. See DTI website for more details: http://www.dti.gov.uk/energy/consultations/microgeneration-responses-alphabetical.shtml.

[18] Report available on the DEFRA website: http://www.defra.gov.uk/farm/acu/energy/biomass-taskforce/

[19] See www.est.org.uk/communityenergy

[20] http://www.dti.gov.uk/renewables/renew—2.1.4.htm

[21] http://ies.jrc.cec.eu.int/WTW

reported to the EU its lack of progress in meeting the non-binding targets set in the biofuels directive. For biomass it is unclear what impact EU policies will have in the future. Please see the Biomass Task Force report for policy recommendations.

Q6. *What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?*

13. For biofuels, the key measure is the RTFO, although further policy support may be required to assist the development of "second generation" liquid biofuels. The Biomass Task Force report provides a good summary of existing policy barriers for biomass and measures to overcome them.

Q7. *What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?*

14. This is outside our area of expertise.

Q8. *Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?*

15. It will be hard to accurately forecast the proportion of home grown versus imported biofuels and biomass in future years. For biofuels, the crucial issue will be the structure of the RTFO, and in particular the carbon and sustainability assurance scheme. If this scheme is quite stringent it may have the effect of reducing imports: not as an explicit trade barrier but because suppliers may be unable to certify the environmental integrity of fuel sourced from overseas.

16. It is hard to imagine there being large imports of biomass, given the low uptake of biomass heating and combined heat and power systems, and because local fuel sourcing is commonly a requirement for project funding. However as the market grows, the issue of imports may appear. This issue should be explored through the DEFRA response to the Biomass Task Force.

Q9. *What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?*

17. In addition to general support for biomass, specific support for the development of the wood waste supply chain would be helpful.

Q10. *What lessons can be learned from other countries' experience in the production and use of bioenergy?*

18. The Energy Saving Trust was a partner in the EU—wide REACT project, examining uptake of biofuels and biomass in Europe, including several case studies. Please see the REACT website (hosted by our Dutch partner SenterNovem) at http://www.senternovem.nl/react

Energy Saving Trust

February 2006

APPENDIX

BIBLIOGRAPHY

Biomass Task Force 2005: Report to Government include link

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DTI 2005, *"Renewables Innovation Review"* http://www.dti.gov.uk/renewables/renew—2.1.4.htm

Energy Saving Trust 2005, "Potential for Microgeneration" http://www.dti.gov.uk/energy/consultations/pdfs/microgeneration-est-report.pdf

LowCVP 2004, *"Evaluation of Ethanol from Wheat"*

Well-to-Wheel Evaluation for Production of Ethanol from Wheat

REACT report and website, http://www.senternovem.nl/react

Annotated bibliography: Studies of UK biofuel and biomass potential/lifecycle environmental impact:

DfT/DTI 2004: "Biofuels and Hydrogen to 2050"

Good summary of long-term forecasts, including detailed potential for UK domestic biofuels production. http://www.dti.gov.uk/energy/sepn/futuretransport.shtml

Energy Saving Trust/IEEP/NSCA 2002, "Fuelling Road Transport"

Study using linked energy and transport models to compare long-term CO_2 reductions from biofuels and hydrogen.

http://www.publications.dft.gov.uk/pubdetails.asp?pubid = 458

LowCVP Website

There are a large number of transport biofuels studies on the LowCVP website, including several looking at the feasibility of carbon assurance schemes in the RTFO. Rather than list them here the Committee staff are advised to visit http://www.lowcvp.org.uk/resources/reportsstudies/index.cfm?Start = 1

Memorandum submitted by The Royal Society for the Protection of Birds (Bio 10)

SUMMARY

1. The RSPB believes that bioenergy could play an important role in helping meet the UK's greenhouse gas emissions as part of a mix of renewable energy sources. This potential can only be realised sustainably, however, if a strategic framework is in place to ensure genuine emissions savings are made and that this is not at the expense of biodiversity and the wider environment.

INTRODUCTION

2. The RSPB considers that human-induced climate change poses the biggest long-term threat to global biodiversity. We therefore support policies and measures that reduce the anthropogenic greenhouse gas emissions that cause climate change. The RSPB endorses the UK Government's aim to cut emissions by 60% by 2050, a target that we should try hard to surpass. The RSPB is a founder member of Stop Climate Chaos, a coalition of environment, development, faith-based and other organisations campaigning to limit climate change. Global CO_2 pollution needs to peak by 2015 and decline steeply thereafter to stay within the 2°C average global temperature increase widely held to be the limit of "safe" global warming. To be reasonably sure of staying below the 2°C target, absolute emission reduction rates of 3% per annum are likely to be required.

3. Climate change and the alarming rate of biodiversity decline worldwide are the most critical environmental challenges society faces today; a point that was recently voiced by former Government Chief Scientist, Lord May. Policy should therefore strive to address both. As a minimum, tackling one must not unnecessarily exacerbate the other. Government is committed to addressing biodiversity loss through a number of targets, including the EU commitment to halt biodiversity loss and the Public Service Agreement to reverse the decline in farmland birds.

4. The RSPB supports the use of bioenergy as part of a wider climate change mitigation strategy and believe that bioenergy could play an important role in the UK's mix of renewable energy sources. However, this support is contingent on a strategic framework designed to ensure the industry's development has minimal negative impacts upon biodiversity, locally and globally, and offers genuine and proven reductions in greenhouse gas emissions. This framework should include:

(i) A spatial plan for bioenergy development based on a comprehensive understanding of the social and environmental implications of growing biomass at a large scale.

(ii) Provision for the incremental development of bioenergy with ongoing monitoring and scheduled review points, similar to that seen in the second round of offshore wind power development.

(iii) A robust strategic environmental assessment and the application of Environmental Impact Assessments of bioenergy developments at the local level.

(iv) Accreditation for all bioenergy, covering greenhouse gas emissions throughout the full life-cycle of the product and minimum environmental standards.

5. We believe it is critical that these concerns are at the heart of a policy framework designed to encourage bioenergy, and that the industry's credibility will be dependant on this. This means that environmental impacts must be factored in to bioenergy's development from an early stage—a lesson learnt from the

development of other renewable energies, such as onshore wind. If a well designed framework is in place, integrated solutions and win-wins are possible. If it is badly designed, we can see bioenergy further exacerbating biodiversity losses.

Question 1: What is the real scope for biomass and biofuels to contribute to tackling climate change? What proportion of the UK's energy and transport supply could they provide?

6. Bioenergy is not a silver bullet, able to solve climate change while reversing the fortunes of struggling farmers, and we are deeply concerned that it is being portrayed in this way. In reality, there is already considerable demand for land, and the use of land to produce biomass and biofuels may carry a significant opportunity cost as it competes with the use of that land for producing food, other non-food crops and conservation.

7. The real question is therefore not what proportion *could* they supply, but what proportion *should* they supply. The answer should be guided by the public benefit generated from each use, and the demands of the market. In particular, land should not be used for bioenergy at a scale where it would either endanger the supply and cost of food, particularly to developing countries, or damage biodiversity through displacing other, important land-uses.

Question 4: Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?

8. As part of a strategic framework for sustainable bioenergy development, Strategic Environmental Assessment should be applied to bioenergy before production is taken up to a significant level, and this should guide future developments. Environmental Impact Assessments will be necessary at the local level to steer development of biomass away from environmental conflict. This will need to be supported by clear guidance at a national level to encourage solutions that recognise the need to conserve the environment and biodiversity when planning for biomass developments.

9. As part of a spatial plan for bioenergy, the land use implications of high-level policies to encourage bioenergy need to be assessed. Impacts should be monitored and regularly reviewed in order to identify and react to unforeseen environmental impacts. For example, excessive demand for wood and short rotation coppice could place massive pressure for restocking and new planting of fast growing conifers with potential adverse impact on high biodiversity value areas of open ground habitat.

10. Accreditation for bioenergy will be required to ensure genuine lifecycle greenhouse gas emission savings are made and minimum sustainability standards are adhered to, so that biofuel development does not undermine Government's wider commitments, including reversing the decline in farmland birds by 2020.

11. Accreditation for bioenergy is necessary as the greenhouse gas emissions savings and wider environmental impacts vary widely according to life cycles. This is particularly true for bioenergy from energy crops, as shown in the divergent results that emerged from the three major well-to-wheel studies that contributed to the Government's recent analysis of biofuels. Their studies found, for example, that the emissions savings from replacing petrol with bioethanol from sugar beet ranged from 63% to –11% (ie an increase in emissions of 11%). A similarly diverse impact on biodiversity can be seen (see Question 7).

12. As a result, the RSPB believes it to be imperative that an accreditation scheme is developed alongside a Renewable Fuels Obligation.

13. We envisage this scheme accrediting those biofuels that offer life cycles emissions savings over single or multiple threshold values, or in direct proportion to the emission savings compared to traditional fossil fuel equivalents. Only accredited fuels should count towards meeting Renewable Fuels Obligation commitments. Accreditation should encourage carbon optimal input management, ie management designed to maximise the emissions savings through efficient use of energy inputs. This requires, among other things, achieving the optimal balance between fertiliser input and yield, as fertiliser use is usually the single largest contributor to greenhouse gas emissions in the life-cycle of a biofuel.

14. Much technical work on accreditation has been conducted through the fuels subgroup of the Low-carbon Vehicles Partnership, a stakeholder group established by Defra, which we hope will feed into the development of an accreditation scheme.

15. Environmental standards are needed as part of an assurance scheme to ensure that in meeting the primary objective of reducing greenhouse gases, sustainability is not undermined by unnecessary damage to the wider environment. These standards should be designed to safeguard biofuel development from adversely impacting upon biodiversity, soil and water. Some of the standards that would need to be included are:

- The protection of important habitats from conversion into bioenergy production, including, for example, set-aside, semi-natural grasslands and peat bogs;
- Ensuring appropriate scale and spatial distribution of bioenergy crops to avoid damaging monocultures and consequent loss in landscape heterogeneity;

16. The fuels subgroup of the Low-carbon Vehicles Partnership have commissioned a study to develop possible criteria that would meet these requirements, but the results were not available in time for this Enquiry.

17. Environmental accreditation for forestry and short rotation coppice (SRC) is well developed, providing a good basis for the environmental standards that would be required for accreditation of bioenergy from forestry and SRC. Carbon accreditation for this sector is yet to be developed.

18. We recommend that the UK Woodland Assurance Scheme is used to certify the sustainable management of forestry and woodland management for biomass objectives, including agricultural short rotation coppice, with linked use of Forest Stewardship Council Chain-of-Custody traceable certification of the resultant wood/timber products.

Question 6: What level of financial and policy support for bioenergy technologies require in order to achieve the Government's targets for renewable energy?

19. The RSPB believes that a policy framework based on a combination of incentives and regulation needs to be in place to support the development of a sustainable bioenergy sector.

20. Policy support for bioenergy should be demand based, with the aim of building a thriving energy market that rewards low carbon fuels. This means that the focus should be on providing incentives for renewable, sustainable technologies, through grants and differential taxation. Supply based support, such as direct subsidies for energy crop production, should not be used. Our experience with the Common Agricultural Policy has shown that the use of similar subsidies for food production has had a detrimental impact on biodiversity and the wider environment, and that building a supply base without securing a market is an ineffective long-term strategy for the development of a self-sustaining industry.

Question 7: What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?

21. The overall impact of large-scale bioenergy crop production on farmland biodiversity will depend largely on the crops in question and the land-use type they replace. As part of a strategic plan for bioenergy development, we recommend a spatial plan is developed to identify possible areas for bioenergy developments and that this is accompanied with best practice guidance. The aim of this plan should be to deliver multiple public benefits, including, for example, biodiversity, water quality, landscape and access, and minimise any adverse impacts.

A. Previous land-use

22. Where bioenergy crops are grown on intensively managed farmland, research shows overall bird species diversity and breeding density in the local area may be either little affected or increased as a result.

23. Loss of high wildlife value habitats such as wetlands, wet meadows, extensively managed semi-natural grassland and scrub through conversion to bioenergy crops will have negative impacts on some bird species and other components of farmland biodiversity. Marginal farmland habitats such as hedgerows and small areas of unmanaged grassland also provide valuable wildlife habitats and any net loss of these due to bioenergy crop planting is likely to have negative effects.

24. The most immediate threat posed to biodiversity is the loss of set-aside to bioenergy crops. This is of particular concern as set-aside land is known to provide important feeding and nesting resources for many farmland birds. In the breeding season, set-aside holds relatively high densities of many bird species, compared to other arable land-use types and provides important nesting opportunities for species of high conservation concern. 80% of the wintering population of linnets East Anglia spend winter on set-aside, compared to only 1% on winter cereals. The UK linnet population has already declined by 48% since 1970.

25. We accept that set-aside is an illogical anomaly in the new decoupled, market-oriented system. The RSPB believes that it should be phased out and the benefits it provides should be brought into the Stewardship scheme so that farmers are rewarded appropriately. Currently, the Government's farmland bird Quality of Life indicator is levelling off, although the overall decline in farmland bird populations has not yet been reversed. Factors which are likely to have contributed to the levelling off of the Index include milder winters, agri-environment schemes, and set-aside. The impacts of the new Entry Level Scheme are not yet apparent in the Index, as the data pre-date the launch in spring 2005. It is clear that the rapid loss of set-aside to bioenergy crops without a parallel process of putting an equivalent amount of land into wildlife management is likely to put populations back into decline.

26. A spatial plan for bioenergy production should consider the future biodiversity potential of land as well as assess its current value. Unregulated coppicing of willow may lead to the loss of land with high potential to deliver public benefit through wetland habitat creation. The wetland vision being produced by the Environment Agency, English Nature, the RSPB and the Wildlife Trusts should provide guidance here.

B. Bioenergy crops

27. While an increased production of conventional crops, such as oilseed rape, sugar beet and wheat, is unlikely to have a significant impact on biodiversity in itself, the large scale cultivation of new crops, including woody crops and perennial grasses, represents a considerable ecological shift from conventional farmland habitats. The RSPB carried out a review of the known and potential effect on biodiversity of energy crops in the UK in 2003 the results of the study are summarised below.

28. Short rotation coppice (SRC) has been found to host a generally higher density and variety of bird species than is usually seen on arable land or improved grasslands. Types of bird species depend on the age of the plantation. Young crops attract birds that prefer open landscapes, including a number of species that are of medium or high conservation concern in the UK such as the lapwing, skylark, meadow pipit, wagtail and corn bunting. Mature plantations generally host more common species that are currently of low-medium conservation concern, such as the pheasant, robin and blackbird. SRC plantations also support higher invertebrate populations than conventional crop types and as input requirements are low, there is the potential for diverse plant communities to be supported. These results come almost entirely from studies of relatively small pre-commercial SRC plantations, larger commercial plantations may have different advantages and disadvantages.

29. Little is known of the potential impact that perennial grasses, such as Miscanthus, canary grass and switchgrass, could have in the UK and Europe. They are unlikely to provide seed food, and are not suitable habitats for open ground species. However, they may prove suitable habitats for species characteristic of reedbeds and dense herbaceous vegetation or scrub, eg reed warbler and reed bunting. Plantations are likely to host a diversity of invertebrates unless widespread cultivation leads to known pests causing problems and results in increased pesticide use.

30. It is the management regime of the bioenergy crop that will ultimately determine their impact on biodiversity and the wider environment. For example, increases in the area of spring-sown crops are likely to have major benefits for farmland birds, such as skylarks and yellow wagtails. Currently, guidelines are best developed for conventional crops. Of the novel crops, only SRC has recognised guidelines. These have the specific aim of increasing the biodiversity value of the crop by including features such as rides, headlands and stands of different age-class to increase habitat heterogeneity.

31. In the medium to long term, Genetically Modified (GM) bioenergy crops may enter the market. We are already aware of GM drought tolerant, salt tolerant and frost tolerant bioenergy crops being developed. As with all GM crops, the RSPB believes it is imperative that these are assessed on a case-by-case basis to determine impacts on biodiversity, using a methodology based on the recent Farm Scale Evaluations. These varieties pose further risk as they are likely to be grown in areas that are not currently intensively cropped and are of high biodiversity value.

C. Scale and spatial distribution of bioenergy crops

32. As with all crops, the scale and spatial distribution of energy crops will greatly determine their impact on birds and the wider environment. The level at which bioenergy is produced will determine these factors. Generation could either be:

— Large-scale and based on a national transmission network fuelled by large generating units; or,

— At the local-level and based on small production units that form part of a distributed generation network.

33. Current infrastructure and policy strongly favour the first option. Economies of scale, transport costs and other practical factors encourage crops to be grown (or imported) in close proximity to where they are processed, as is seen in the sugar industry. This is reflected by UK grant funding for bioenergy crops, which specifies that they should be grown as close as possible to the end user, usually within 25 miles. Large-scale generation is therefore likely to result in significant simplification of the landscape in terms of habitats and vegetation structure as large uniform areas of bioenergy crop are produced in the area surrounding the processing facility. It is likely that this spatial arrangement of bioenergy crops will reduce the biodiversity benefits of the crops themselves, making small-scale generation preferable from this perspective.

D. Biomass from forestry

34. While not an "energy crop" *per se*, the environmental impact of biomass production in forestry is potentially wide ranging and thus important to highlight here. It includes damage to existing habitats and species through increased felling activity, planting in inappropriate areas, restocking areas with trees in areas which would be better restored to important non- wooded UK Biodiversity Action Plan priority habitats. On the other hand, increased markets for wood and timber products could encourage beneficial woodland management in neglected and under managed woods where biodiversity is in decline.

35. Carefully managed, smaller scale rural development projects that use coniferous plantation forest residues and existing coppice wood chipped or pelleted for local heating, could support the restoration of coppice management in lowland woods and native woodland management. This is an example of a "win-win" bioenergy development that would be positive nature conservation measure while also aiding rural development and climate change mitigation.

36. The strategic planning of forestry biomass should recognise the potential for very large wood/timber demand from power generating stations. This could have serious implications on transport infrastructure and on carbon emissions from increased haulage. It may also result in the retention of remote "timber" plantations on restorable open-ground habitats, or short rotation coppice of low biodiversity value on important agricultural habitats.

37. It is also important to address the potential import of significant quantities of timber and timber products, in line with the UK Government's commitments in the UK Forest Partnership for Action, to ensure that procurement from abroad is environmentally sustainable.

Question 8: Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?

38. A certain amount of bioenergy and bioenergy feedstocks, particularly biofuels, will inevitably come from abroad. This is not inherently negative, though the costs of transport to the environment must be accounted for. Indeed, imported bioenergy may make a valuable contribution to sustainable development, but only if there is an international accreditation scheme in place to ensure imports meet the same standards as domestically produced feedstocks and bioenergy products.

39. The most significant risks posed by bioenergy production from outside the EU arise from the production of sugar cane for conversion into bioethanol and palm oil and soy into biodiesel. Sugar cane has very little biodiversity value and continues to expand at the expense of globally important natural habitats. Our BirdLife International partner in Brazil has identified sugar cane expansion as a key driver of the destruction of the Cerrado, a savannah-like habitat that is home to the fourth highest level of bird diversity in the world. Similarly, Soy expansion is driving the destruction of rainforest in South America, and palm oil in Asia. The establishment of oil palm plantations in Indonesia and Malaysia, for example, is a major driver of lowland forest lost, one of the most important habitats for biodiversity in the world.

40. The very real risks posed by bioenergy development internationally means that the RSPB could not support bioenergy unless international accreditation was in place. Until it is, UK and EU policy should focus entirely on domestic production as it is traceable and the carbon emission savings and sustainability of the product can be traced and accounted for.

RSPB

February 2006

Memorandum submitted by Scottish Renewables Forum (Bio 11)

1. Please find enclosed our views relating to the Environment, Food & Rural Affairs Select Committee Inquiry into "Climate Change and the Role of Bioenergy".

2. Scottish Renewables is Scotland's leading renewables trade body, representing over 160 organisations and individuals involved in the development of renewable energy projects in Scotland. Our membership ranges from community groups and sole traders, up to major Scottish utilities and international plcs. Between them they are active in the development of biomass, hydro, solar, wave, wind and tidal energy projects. Further information about our work and our membership can be found on our website.

3. This response, formed through consultation with our members, focuses primarily on biomass for the heat and electricity sectors, reflecting the membership and expertise of Scottish Renewables. However, many of the points made have similar implications for the biofuels sector.

4. We recognise that the UK Government is responsible for energy policy, however there is a role for devolved administrations in specific areas of largely reserved matters. In this case the Scottish Executive has responsibility for the promotion of renewable energy, including bioenergy. This response recognises that different levels of government have separate responsibilities and that, in responding to the inquiry, we have preferred to make a more substantive submission indicating how co-ordinated actions across the UK are important in ensuring that renewable energy policy is effective.

5. In summary,

(a) Scottish Renewables regards bioenergy to be a central part of the UK's energy future and recommends that the Scottish Executive and UK Government act with urgency to establish a mixture of revenue and capital grants to support the deployment of first generation bioenergy schemes around which infrastructure can assemble or from which other projects can evolve.

(b) Furthermore, the Scottish Executive should set a target for renewable heating at a minimum of 10% by 2020.

(c) Schemes such as the Energy Efficiency Commitment should be adapted and a Renewable Heat Commitment developed, with the Executive matching supply company payments to help incentivise installation of renewable heating measures in households. Such a scheme should complement a UK wide system to prevent two conflicting support structures.

We will now address each question in turn.

Q1. *What is the real scope for biomass and biofuels to contribute to tackling climate change? What proportion of the UK's energy and transport fuel needs could they provide?*

6. The bioenergy industry is central to the delivery of the UK's international obligations on climate change. The use of biomass material to displace energy production from fossil fuels will have a beneficial impact on carbon emissions and the encouragement of energy schemes using local timber will result in lower transport emissions.

7. As reported by the FREDS Biomass Energy Group (BEG),[22]

> *Biomass, particularly wood fuel, is accepted as carbon neutral. It can have a positive effect on the environment. It is also a predictable and firm source of energy supply and therefore an important contributor to a diverse energy mix, which is vital to security and continuity of supply.*

8. Scottish biomass is uniquely placed within the UK to contribute to both Scottish and UK renewable targets by 2010. This is because, as FREDS reports, Scotland has a substantial existing and expanding resource from managed woodlands and sawmill products which can be accessed for wood fuel almost immediately. The GB wide forestry resource is predicted to grow well in excess of demand over the next three decades, and around 60% of that resource is located in Scotland. According to FREDS, the future harvest level is likely to be around 5.5 million cubic metres above current use, and the minimum size of the biomass electricity market in Scotland could be as much as 450 MW of installed capacity. Other factors, such as the growing of energy crops may greatly increase these figures.[23] Furthermore, this capacity figure would be significantly greater if the use of biomass materials for heat is increased.

9. From the work that FREDS has undertaken, alongside the findings from reports by the Biomass Task Force,[24] Sustainable Development Commission[25] and the DTI/Future Energy Solutions,[26] it is clear that there is considerable impetus to develop biomass as a renewable fuel. Scotland is well placed to derive benefit by developing a new business arena for the forestry sector and by improving the Scottish economy through reducing dependence on external fossil fuel supplies and related uncontrolled energy prices.

Q2. *How cost-effective are biomass and biofuels in comparison with other sources of renewable energy?*

10. The costs relating to different renewable energy technologies vary depending on many factors specific to each project and technology. At present, hydro and wind are the most advanced forms of renewable energy in the UK in terms of sector development. Bioenergy is at an earlier stage of development in the UK than more mature renewable technologies so requires initial financial support until necessary infrastructure is in place and the market has developed to a viable scale.

11. Furthermore, as bioenergy is the only form of renewable energy that requires the purchase and transportation of fuel, there are additional costs to be incurred. FREDS reported that transporting wood fuel is a major issue for the development of a biomass industry in Scotland. Transport costs can be a limiting factor in the price and financial viability of biomass as a fuel. Well located biomass projects, including co-location of integrated energy users of electricity and heat, and innovation in the supply chain present opportunities to reduce cost.[27]

12. It is important to note, however, that wood fuel for heat has recently been reported as now becoming cost-competitive with conventional fuels. However, the capital costs and limited infrastrucuture remain barriers to development.

13. In order to meet both Scottish and UK climate change targets, not to mention the economic and employment benefits of different renewables, it is important to encourage a mix of renewable energy technologies at a range of scales.

[22] Forum for Renewable Energy Development in Scotland (2005), Promoting and Accelerating the Market Penetration of Biomass Technology in Scotland, Scottish Executive, para 3.

[23] FREDS (2005), para 15–19.

[24] Biomass Task Force (2005), Report to Government.

[25] Sustainable Development Commission (2005), Wood Fuel for Warmth.

[26] Future Energy Solutions (2005), Renewable heat and heat from combined heat and power plants—study and analysis, DTI & Defra.

[27] FREDS (2005), para 37.

Q3. *How do biofuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?*

14. Provided that the resource is managed sustainably, bioenergy is generally carbon neutral as the biomass resource absorbs the same amount of carbon dioxide (CO_2) during its growth as it releases during combustion.

15. There are, of course, additional carbon emissions produced during the construction of the plant and processing and transportation of the fuel. All renewable energy projects produce a minimal amount of emissions during construction; however these are offset over a relatively short period of time. By encouraging the use of biofuels in related transport, these emissions could be further reduced. In the meantime, FREDS recommends that journeys by road should be minimised wherever possible, and alternative means of transport should be utilised where available.

16. The Royal Commission on Environmental Pollution reports that these emissions are more than offset by the very low conversion emissions, in comparison to coal and natural gas.[28] Nevertheless, it remains important that all steps possible are taken to reduce the distances over which the fuel resource is transported.

Q4. *Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?*

17. As asserted in the FREDS report, the use of local wood fuel in biomass plant located in or close to areas of supply will offer the most sustainable way forward for Scottish biomass development. There may also be opportunities to develop integrated sites where wood processing and generation using co-products can be encouraged to co-locate. This also fits with the Government's wider aims to reduce carbon emissions by discouraging long distance transportation of fuel and to encourage the use of combined heat and power (CHP) to maximise energy conversion efficiency.[29] Furthermore, as highlighted in point 3 above, the increased use of biofuels in transportation would further offset net CO_2 emissions.

Q5. *What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and biofuels?*

18. The setting of renewable electricity targets and the introduction of the Renewable Obligation/ Renewables Obligation (Scotland) have already had a very positive impact on the development of biomass projects within the electricity generation sector. However, the RO is technology blind, and so favours the most established renewable technologies such as wind and hydro.

19. Furthermore, Scottish Renewables welcomes the announcement made in November 2005 to introduce a Renewable Transport Fuels Obligation, and set fuel providers with a target for biofuels sales. Likewise, the renewable heat sector now requires a target and support mechanism to stimulate the market and supply chain. These recommendations are detailed further in point 6 below.

Q6. *What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?*

20. It is Scottish Renewables' view that the FREDS report carries much good analysis of support necessary for biomass generation, which we would recommend to you for adoption.

21. In particular the report notes:

> *The economic appraisal carried out for BEG identifies a strong case for Government support for the biomass sector. Without it, it is unlikely that the private sector would be willing to invest in new biomass power plant and economic potential would be lost. The [Scottish] Executive's objective of meeting its renewable electricity targets through a mix of renewable energy technologies would also be undermined.*[30]

22. The report goes on to discuss funding issues in further detail, but the inference is clearly on public sector support from the Scottish Executive and UK Government to assist in delivery of biomass generation projects.

23. It is Scottish Renewables' view that early development of biomass generation will be best supported by two basic means: firstly through a mix of revenue and capital grants to support deployment of a first generation of schemes around which infrastructure can assemble or from which other projects can evolve, and secondly by grants to provide necessary infrastructure (for example chipping, pelletising, harvesting, transport) to establish the necessary parts of the biomass supply chain outlined in the FREDS report.

[28] Royal Commission on Environmental Pollution (2004), *Biomass as a renewable energy source,* para 4.26.
[29] FREDS (2005), para 42.
[30] FREDS (2005), para 52.

24. Scottish Renewables has been working closely with the Scottish Executive to encourage the introduction of a funding mechanism which combines capital and revenue support. To avoid destabilising and reducing confidence in the RO we recommend that any revenue support scheme should be separate. A precedent has already been set by the proposals for the Marine Renewables Deployment Fund (MRDF). A biomass support scheme modelled on similar lines should have the following key attributes:

(a) The mix of support should be project specific.

(b) The total level of grant assistance for each project should be capped with an underlying cap on capital grant payments. This arrangement mirrors the MRDF.

(c) Revenue support should be available as a mechanism to improve the bankability of projects. We believe that the level of support required will be in the range £25–£40 per MWh. This support should be available for a minimum of seven years.

(d) Funding support should be targeted at projects which are of a scale, location and technology type that fits the types of scheme recommended by BEG and which are, or have the prospect of, securing planning consent and—for electricity projects—grid connection.

25. Support for capital investment in the sector has been identified as essential to facilitate projects. It is Scottish Renewables' view that revenue support is also required for many projects to reduce (the cost of) risk in the wood supply chain and uncertainty in the value of the annual Renewables Obligation recycle fund.

26. Furthermore, action is needed from the UK Government and Scottish Executive in developing a renewables target for the heating sector, and in establishing appropriate support mechanisms for an emerging renewable heat market. Scottish Renewables has recommended to the Executive that it should set a minimum target of 10% of heating to come from renewable sources by 2020. We would recommend that the UK Government investigates and sets an equivalent target. In addition, there is a role for the public sector in taking the lead when renovating and building new public buildings to investigate renewable energy, including biomass, for heating.

27. The Biomass Task Force[31] conclusion that a Heat Obligation would not be the most suitable mechanism for supporting the heat market is one that we support. We are therefore supportive of development of grant based systems that can assist delivery of a heating market, backed up by a target and underpinned by more appropriate market support mechanisms. Such a market should be established to support a range of renewable heat technologies, including solar thermal and heat pumps.

28. It is worth thinking about the likely heat market that might evolve. In Scotland we foresee that the major market will be for small or medium sized fuel users. Initially, these installations will need to be clustered to aid creation of a fuel supply chain linking fuel producers, distributers and users. Another key issue is that development is likely to be led from rural or semi-rural areas, and that it is these areas of Scotland that also tend to be outside the mains gas network. This will mean they rely on more expensive, more polluting forms of fuel. Interestingly though, a significant proportion of this rural population live in hard to heat homes that cannot easily be made efficient. There is therefore much scope to assess how grant support for installing renewable heat technologies like biomass stoves, heat pumps and solar thermal panels could assist in reducing domestic fuel poverty in these rural areas.

29. It is also worth considering how funding might be generated to cover a renewable heat scheme. We would like to see more consideration of how existing mechanisms could be used. In particular we would like to see closer investigation of the Energy Efficiency Commitment schemes whereby supply companies must fund installation of energy efficiency measures amongst their consumers. The EEC scheme allows use of innovative measures like heating systems, but take up has generally been poor. It is up to the supply companies to choose how best to utilise EEC funds, so it would not be appropriate to change this and give direction.

30. Instead, available government monies could be used to partially match this funding and therefore incentivise supply companies to invest more of their EEC funding on heating based schemes. This would be particularly appropriate in rural areas with difficult to heat homes away from the mains gas network.

31. Adapting and supplementing the EEC would facilitate use of currently available monies, and avoid creation of new funding streams. Also, it would create incentives for supply companies to act on renewable heat, by providing them with new methods by with their Energy Efficiency Commitments can be met. They further benefit by knowing that the funding is used to install measures in their customers' homes (where the funding came from and where they should receive recognition and the associated benefits of customer loyalty).

32. Our recommendation to use the EEC is to avoid creating an Obligation System that is the mirror of the RO. Given our recommendation that the EEC should be used we would urge the Scottish Executive and UK Government to consider establishing a "*Renewable Heat Commitment*". We feel that this better describes such a system.

[31] Biomass Task Force (2005), Report to Government.

33. Furthermore, where CHP schemes provide heat to households (for example through district heating networks) they could also benefit through use of the system outlined above. Larger scale CHP systems can also be supported through changes to the EU Emissions Trading Scheme, as recommended in the Biomass Task Force report.

34. In terms of delivering grant funding to small and community scale biomass schemes, this has already proved reliable through the Energy Saving Trust's Scottish Community & Householder Renewables Initiative (SCHRI) and the DTI/BRE's Clear Skies initiative. Therefore, we would recommend that existing networks and funding mechanisms such as SCHRI should be utilised/adapted.

35. Finally, it is worth noting that for bioenergy the fuel stock must also be purchased (as well as the equipment). This means that bioenergy has other additional issues that need to be overcome compared to solar thermal and heat pump technologies. In the past this has created a market barrier because capital investment is required not only in boiler plant but also in the fuel supply chain. It has been recognised in Scotland that a key issue is how to help support establishment of this wood supply chain. It is our view that grants must be put in place to help fund establishment of initial infrastructure that supply chains and installations can cluster around.

Q7. *What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?*

36. We have no comments to make on this point.

Q8. *Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?*

37. The biomass resource in Scotland is mainly in the form of forestry, although energy crops also have role. If there is a market, farmers will supply into it. The creation of new woodlands is already a policy at the EU, UK and Scotland levels. New woodland sequesters carbon and the sustainable removal of biomass from the woodland provides an ongoing supply of carbon neutral fuel. Importing bioenergy is less desirable as it reduces the carbon neutrality of the resource.

Q9. *What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?*

38. It should be noted that wood is not "waste"—there are secondary markets for these materials. The classification of biomass fuels as "waste" could be regarded as the biggest "own goal" to have yet been scored by Government. All biomass products, if managed sustainably, can be used in the production of renewable heat and electricity. By encouraging the use of biomass for energy, secondary forestry and agriculture products (such as tree thinnings and brash) will become more widely used rather than left on the forest floor. This can be done by overcoming the market barriers that currently exist, including a lack of awareness, few secure supply chains, perceived risk and a lack of skilled engineers willing to install and maintain biomass boilers.

Q10. *What lessons can be learned from other countries' experience in the production and use of bioenergy?*

39. Biomass is a proven and practical source of energy in many European countries. The FREDS Biomass report highlights:

> *The role that biomass might play is likely to be highly significant since it already provides approximately 64% of total EU renewable energy utilisation. Biomass provides approximately 9% of "green electricity" across Europe.*[32]

40. Although the biomass market for renewable energy in the UK is at an early stage of development, the technology is mature and proven in other European countries, including Austria, Sweden and Finland.

41. As FREDS also points out, the development of power and CHP plants could serve to accelerate the development of supply chains which would be useful in the development of heat plants. To become a properly mature market there is a need to focus on bioenergy of all forms and scales, from small scale heat to CHP and larger scale power plants. The use of biomass for electricity and CHP, including co-firing, is one of the factors that could stimulate a viable heat sector.[33]

[32] FREDS (2005), para 2.
[33] FREDS (2005), para 7.

42. I hope that the above information is of assistance to you in your inquiry. If you would like further information, or would wish us to present our views to the Inquiry itself, we would welcome the chance to assist you further.

Scottish Renewables Forum

February 2006

Memorandum submitted by British Sugar plc (Bio 12)

INTRODUCTION

1. This submission will concentrate on British Sugar's particular interest in producing bioethanol as a road transport fuel. The company announced in December 2005 that it would be going ahead with the construction of a £20 million bioethanol plant at its sugar factory site in Wissington, Norfolk. The plant will be completed and operational by early 2007 and will manufacture 55,000 tonnes (70 million litres) of bioethanol each year from sugar beet. The decision to go ahead with this project is testimony to British Sugar's confidence that the policy environment has improved sufficiently to justify some investment in UK domestic bioethanol production. However, as will be shown in this paper, there are still a number of steps that must be completed before there can be confidence in the development of a domestic biofuel industry that will be capable of meeting 5% and more of the UK's transport fuel needs.

THE COMMITTEE'S QUESTIONS

Q1. *What is the real scope for biomass and biofuels to contribute to tackling climate change? What proportion of the UK's energy and transport fuel needs could they provide?*

2. It has been recognised by the Government and others that biofuels can make an immediate contribution to reducing carbon emission in the transport sector. Road transport accounts for about a quarter of the UK's carbon emissions and with increasing car ownership and usage there is every expectation that this figure will rise in the future. The technology to produce biofuels from conventional crops such as wheat, sugar beet and oilseed rape is available today and the Government have confirmed that a 5% biofuels usage would reduce carbon emissions by at least one million tonnes. However, it must be noted that biofuels will make a contribution to tackling climate change—they cannot provide the whole solution. They should be seen as part of the mix of energy sources that will be needed to reduce carbon emissions and help to tackle climate change.

3. Today the UK has sufficient crop surplus production of cereals and sugar that could be converted to bioethanol to replace at least 5% of all the petrol used. Beyond this, crop yields are improving giving a larger raw material volume year on year. Technologies are also being developed that will convert lignocellulosic feedstock (woody biomass) into bioethanol to widen the production scope even more. Raw materials include those parts of conventional crops that are not currently used for bioethanol production, wood wastes and energy crops.

4. It should also be noted that there is also considerable potential for increased biofuel feedstock production on currently available UK arable land. The DEFRA 2005 census states that the UK has a total of 5.8 million hectares of land under arable production, with an additional 0.6 million hectares under set-aside. If just 10% of this combined total were reserved for energy crops, (a reasonable long-term target) then an additional 640,000 hectares could be made available, generating another two million tonnes of bioethanol. This would be equivalent to an additional 10% of UK petrol substitution, over and above the figures quoted in paragraph 3. Imports of either feedstocks or end product would further add to this contribution. There is consequently potential for biofuels to substitute a highly significant proportion of UK transport fuel in both short and medium term with equivalent climate change benefits.

5. A combination of the measures explained in paragraph 3 and 4 demonstrates that a biofuels target of 20% would be achievable by 2020.

Q2. *How cost-effective are biomass and biofuels in comparison with other sources of renewable energy?*

6. Currently bioethanol costs between 1.5 and 2 times more than petrol to produce. As technology improves and the price of fossil fuels increases this difference will get smaller. The European Commission has estimated that with technologies currently available, EU produced bioethanol would become competitive with oil prices at about €90 per barrel. It should also be remembered that a new biofuels industry will be competing with the established oil industry with decades of sunk costs.

7. Biofuels are currently the only viable replacements for petrol and diesel in the transport sector. If used in conjunction with vehicle technologies like hybrid engines, the carbon savings are multiplied. If there is significant progress towards the use of hydrogen in vehicles in future decades, biofuels, in particular bioethanol, can also provide a source of renewable hydrogen for these new technologies.

Q3. *How do biofuels compare to other renewables, and with conventional fossil fuels, in terms of carbon savings over their full life-cycle?*

8. Bioethanol can be produced in the UK from UK crops with a carbon lifecycle saving in excess of 50% when compared to today's conventional fossil fuels (ref LowCVP work on bioethanol life-cycle). If technologies such as high efficiency Combined Heat and Power, or biomass feedstocks are used, the carbon saving can reach over 80%.

9. Currently carbon emissions from UK refineries stand at 19.8 million tonnes of CO_2 and from offshore activities 19.1 million tonnes of CO_2 per year, with these numbers increasing. As current conventional oil reserves are exploited oil companies will move to the more difficult extraction technologies such as using tar sands and ultra heavy crudes which will increase costs, energy consumption and carbon emissions further. As these negative impacts get ever greater then the most sensible course will be to switch to greater production of carbon saving fuels such as biofuels. We believe that the marginal road transport fuel used in the EU will increasingly be from these non-conventional sources from 2010 onwards.

Q4. *Not all biomass is equal; potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?*

10. With progressive CAP reform now well underway, there is an increasing economic imperative for farmers to reduce the use of agricultural chemicals and thereby to improve the sustainability of production. There is a considerable body of legislation in place to ensure sustainable agricultural production, such the Nitrates Directive, the Water Framework Directive and the more recent rules on cross-compliance following CAP reform. There are also voluntary schemes which address sustainability issues such as the Assured Combinable Crops Scheme and the Little Red Tractor scheme.

11. It is the Government's intention within the operation of the Renewable Transport Fuels Obligation to introduce mandatory reporting of both carbon saving and sustainability compliance. This monitoring process, which is likely to be based on existing legislation and schemes will ensure that biofuels production is carried out according to sound environmental principles. If, as seems to be the case from the European Commission's Biomass Action Plan and Biofuels Strategy, there is an intention to introduce similar schemes in other EU Member States, UK production should not be put at a competitive disadvantage through the operation of the RTFO.

Q5. *What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and biofuels?*

12. The cost of biofuel production and market inertia have combined to frustrate the development of a viable biofuels industry in the UK. Government action has been essential to kickstart production albeit in a tiny market segment (mainly biodiesel from waste oil). It is clear that the introduction of the EU Biofuels Directive in May 2003 provided a significant incentive for Member States, including the UK, to look seriously at their domestic policies for the promotion of biofuels and to re-appraise their actions to reduce carbon emissions in the transport sector. The introduction of a fuel duty rebate of 20p per litre for both biodiesel and bioethanol (this latter only came into effect in January 2005) has been successful in stimulating the development of a small market, supplied in bioethanol's case by imports.

13. However, for production to grow to levels that will make a significant reduction in carbon emissions, it has become increasingly clear that Government action is needed to stimulate demand and to create a real market. The Government's announcement in November 2005 that it would introduce a Renewable Transport Fuels Obligation from April 2008 has provided a much-needed impetus to the development of a market. Work is going forward on the precise details of the operation of the RTFO. The success of the market will depend on the success of the RTFO in setting targets and financial mechanisms that will give customers (the oil companies) a real incentive to buy and producers a real incentive to supply biofuels. If the RTFO mechanisms work as intended then the potential for increasing demand and production will reach the projected 5% usage level by 2010 and could reach 15% by 2015 and 20% by 2020.

14. Within the financial mechanisms of the RTFO must come consideration of the future of the current 20p per litre fuel duty rebate. What is important to British Sugar as a potential large scale investor in the UK biofuels sector is that the RTFO is a mechanism that will drive the creation of a UK market of a size set by the Government targets and with the price set by the balance of supply and demand. If the RTFO design is successful in driving market behaviour such that the market "clears" at the specified level; then the 20p rebate is unnecessary. A good RTFO design, with little "leakage" to incumbent fossil fuel suppliers will deliver the targeted biofuels penetration at a lower cost than with a duty rebate and with no direct cost to the Treasury. At this stage it is important not to confuse any "cash out" penalty that the RTFO may incorporate with the "cost" to consumers or indeed the "support" to producers. With an effective mechanism the cost to consumers will just be set by the open market price of ethanol and not by an artificial "certificate" price. In this regard it is important that the flaws from the power market Renewable Obligation are not repeated in this area.

15. The Government has also announced that it will introduce Enhanced Capital Allowances in 2007 for those biofuel plants which can demonstrate the greatest carbon saving. While this is a welcome development its ability to instigate significant change should not be over-estimated.

16. As the UK looks to policies to implement the provisions of the EU Biofuels Directive, the EU Commission's thinking has moved on to giving a greater weighting to biofuels within the EU's overall climate change and energy security policies. It issued a Biomass Action Plan in December 2005 and will publish its Biofuels Strategy in February 2006. These initiatives will help to create markets and to raise public awareness of the cost-effective contribution that biofuels can make to tackling climate change.

Q6. *What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?*

See Q5 above.

17. The current fuel duty rebate and the proposed RTFO have the potential to ensure that industry meets any targets that are set for the transport sector providing the RTFO is strong enough to have an impact on the existing transport fuel supply chain. Up till now this industry has been reluctant to include biofuels in their market mix. It would be too costly for the biofuel industry to set up an independent supply chain to supply biofuels to the end consumer.

Q7. *What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?*

18. As already stated (see Q1) above), there is already sufficient surplus wheat and sugar beet feedstock available to reach a 5% biofuels usage level as set out in the Government's RTFO announcement of 10 November 2005. Reaching this level of usage would therefore have no adverse biodiversity or other environmental impacts. Beyond a 5% usage level, if current legislation and voluntary arrangements, as evidenced in the mandatory reporting proposed under the RTFO, proved insufficient to protect the UK and EU environment then the UK Government and the EU Member States and Commission would be able to introduce further measures as required. British Sugar can see no logic for sustainability constraints being applied solely to materials for liquid biofuels as opposed to material for all biomass.

19. Of more concern, however, are the potential adverse environmental impacts of the production of biofuels, especially bioethanol, in exporting countries. It is difficult to see how a mandatory reporting scheme under the RTFO can apply with equal effect to imports as well as UK biofuel production. The legislation and monitoring and surveillance schemes may not be available in all supplying countries to give the degree of confidence that UK production will be competing fairly in environmental terms with imports. This is an area of great concern in the detailed development of the RTFO and could seriously undermine the good intentions of the policy.

Q8. *Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?*

20. If substantial inroads are to be made in replacing fossil fuels then the EU will have to rely on a combination of domestically produced and home produced raw materials and finished products. If the demand is created by a combination of Government policy and the peaking of oil supply, then there will be a global market for biofuel products that will be filled by a combination of home production and imports. EU and UK policies on fuel security will encourage us to have diverse energy supply chains and this includes those for biomass and biofuels.

Q9. *What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?*

21. The biggest driver to develop the technologies to use by-products and wastes will be by introducing policy that creates demand in the market place, by pushing, for instance, RTFO targets beyond the easily obtainable through conventional crops. This demand will encourage industry to make the necessary investments in R&D to develop and commercialise the technologies that are already in the pipeline such as lignocellulosic bioethanol.

Q10. *What lessons can be learned from other countries' experience in the production and use of bioenergy?*

22. The best example for bioethanol introduction in Europe is Sweden. With a combination of tax breaks for biofuel and legislation applied to retailers to set up E85 (85% bioethanol 15% petrol) filling station points, virtually all of Sweden's petrol now contains a minimum 5% bioethanol. Additionally, with other measures such as free parking, exemption from congestion charging and tax breaks for drivers and

companies, a market has developed for flexfuel cars (cars that can run on both petrol and E85) with Ford, Saab and Volvo producing cars for the Swedish market. These cars are now selling much better than their petrol-only counterparts. This in turn creates further demand for bioethanol.

British Sugar plc

February 2006

Memorandum submitted by Food and Drink Federation (Bio 15)

With the UK and EU bio-energy sectors going through such a rapid period of change and expansion, the Food and Drink Federation (FDF) considers that the Environment, Food and Rural Affairs (EFRA) Select Committee's investigation into the role of renewable energy in meeting the UK's climate change objectives is timely.

FDF represents companies with a wide variety of interests in the bio-energy debate—some are producing bio-fuels and others procure large volumes of agricultural raw materials that can be used in bio-energy production. For this reason, FDF does not wish to make detailed comments on the questions the Committee is considering at this time. Our members are however concerned that financial incentives aimed at encouraging the development of the bio-energy sector may indirectly disrupt agricultural commodity markets and lead to raw material supply shortages and price increases for domestic food manufacturers. Given this link between the food and biofuels industries, FDF members believe that that any cost-benefit analysis of the bio-energy sector will need to consider both the direct and indirect consequences of its development. In particular the Government must take the food and drink manufacturing industry's interests into account—and consider any knock-on effects into food production—when formulating new bio-energy policies. Our views on this matter are spelt out in more detail in the attached Position Statement and paper on developments in liquid oil prices.

Director General

BIOFUELS POLICIES AND THEIR IMPACT ON THE UK FOOD MANUFACTURING INDUSTRY

FDF position statement

1. FDF members support the overall EU and UK commitment to promote renewable energy sources as a contributor to long-term sustainable growth.

2. As part of this commitment, the EU is encouraging member states to produce biofuels. In order to stimulate their production at the national level, many EU member states have introduced financial incentives to encourage producers to sell their production into the biofuels industry. FDF members are concerned that such policies may have unintended negative consequences for UK food manufacturers. In particular, they may limit the supply of raw materials available for domestic food production.

3. UK food manufacturers are particularly concerned about the impact that biofuels policies may have on the food industry's supply of rapeseed oil which is a key ingredient in margarine, spreads, mayonnaise and salad cream. We would encourage the Commission to recommend that the European Committee for Standardisation change the current iodine rules to make more oils eligible for biofuels production. This would help reduce the pressure on the domestic supply of rapeseed oil. UK Government statistics indicate that there is less likely to be a similar medium term cereals supply issue, given the current volume of cereal exports and production capability. However, some cereal processors have medium term concerns about the potential impact that biofuels policies may have on the domestic wheat supply. FDF members believe that the Commission should remove policy instruments, such as the current set-aside obligations, which prevent EU farmers from producing more arable crops for human consumption in response to market signals. Import tariffs should also be reduced to enable more arable crops to enter the EU market.

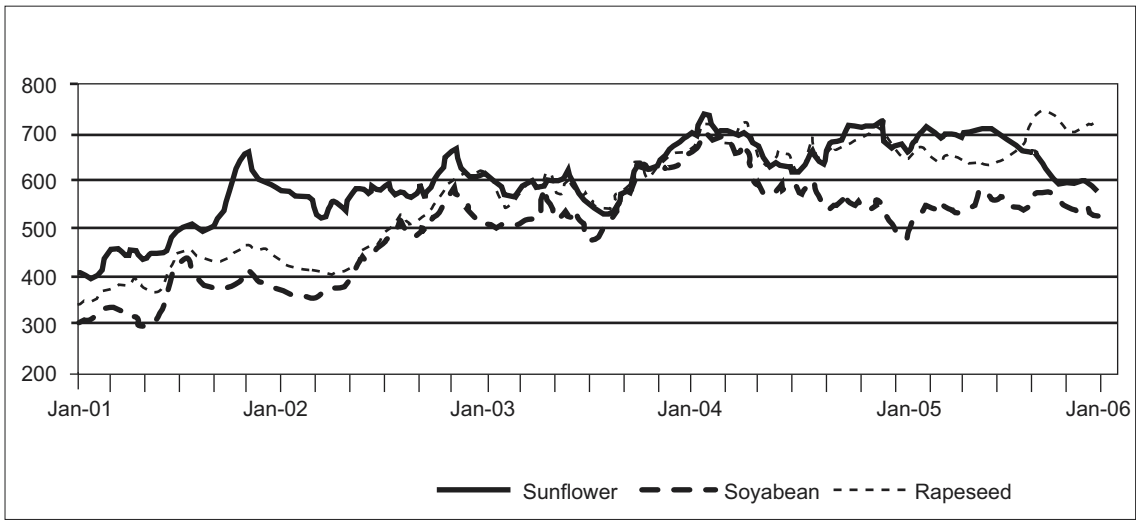
4. Given the link between the food and biofuels industries, FDF members believe that the European Commission and the UK Government must consider the food industry when formulating new biofuels policies. Regulatory impact assessments should be conducted before any new policy is introduced and these should include sections which examine the potential consequences for domestic food manufacturers, both in terms of their food production, co-products production and the energy they use. Decision-makers should also ensure that the food industry is given the opportunity to comment on any draft legislation that may impact upon the supply and price of agricultural raw materials.

Food and Drink Federation (FDF)

February 2006

Annex

Price for Liquid Oils (USD/tonne - c.i.f. Rotterdam)



Source: Reuters

Market situation for rapeseed oil

- "Higher biofuel production should further stimulate world commodity prices, but with the exception of sugar, vegetable oils and oilseed meals, the impact of the additional biofuel production is relatively small: 0.6% to 2.8% by 2014 on top of the impact through higher production costs in agriculture." *OECD*—23 January 2006.
- "Demand for rape oil within the EU in 2005–06 will rise by 26% in order to supply the burgeoning EU biofuel industry, according to the latest figures from German oilseeds analyst Oil World. High demand for biofuels in the EU and rising prices could 'contribute to a decline by 0.1 million tonnes in rape oil consumption in the food sector in October/September 2005–06', the report said." *Agra Europe*—12 October 2005.
- "Robust rapeseed and rape oil demand growth in prospect for 2005–06: Rape oil demand to increase over 1.1 Mn T after almost 1.5 Mn T this season, owing to biodiesel." *Oil World*—October 2005.
- "According to our estimates, rape oil demand in the EU-25 for non-food use has soared to 2.65 Mn T in October–September 2004–05, more than doubling within three years. The European rape oil demand shaping up for 2005–06 will presumably turn the EU into a net importer of rapeseed and/or rape oil." *Oil World*—September 2005.

Memorandum submitted by The Natural Gas Vehicle Association (NGVA) (Bio 16)

EXECUTIVE SUMMARY

1. The definitions provided by EFRA Select Committee are misleading and very limiting, and this response has been written using the meanings of the words such that:

Bioenergy *is the use of* ***biofuel*** *which was created using* ***biomass*** *as a* ***resource***

Biomass *is the* ***resource*** *used to create* ***biofuel*** *to make* ***bioenergy***

2. It is the considered belief of the Natural Gas Vehicle Association (NGVA) that bio-methane is the most appropriate biofuel, and that the route to increasing the use of this cleanest and most environmentally friendly renewable fuel is to extend the use of natural gas as a transport fuel in addition to its present use as a fuel for creating heat and electricity.

3. Most cities around the world accept that natural gas is the cleanest of all the fossil fuels. Bio-methane created from organic waste or by-products offers the same clean emissions but also offers huge carbon savings over all other fuels, renewable or fossil, bio or other, as a result of the avoidance of the methane emissions that would otherwise occur from the waste if it were not treated. As a greenhouse gas, methane when it is released to the atmosphere is 21 times worse than carbon dioxide, so the avoidance of this release

should be the first priority of all those interested in protecting the environment. The energy used to create bio-methane is far less than that used to create any other biofuel, and because only low level energy is needed much of this can be from the sun or the wind.

4. Advantages of bio-methane over other biofuels whether liquid or gas or electric:

Makes a positive contribution to the environment;

Less energy used to create the fuel;

Lower emissions created during the process;

Lower emissions when used as a fuel;

No particulates during creation or use.

5. Bio-methane or Renewable Natural Gas is the ONLY biofuel which offers all of these advantages.

6. This public consultation document, unless seriously challenged in its entire rationale as written, will lead the British government down a route which will damage our industry, the environment and the nation's health.

Definitions

7. The definitions used in the EFRA Committee Questionnaire are very misleading and unclear.

8. The first matter to be resolved is the definition of *energy*. There has been much misunderstanding over the confusion of the words energy and electricity. Energy usually needs a fuel to store it, so that it can be released in a useful form. Electricity only becomes energy when it is being used (or wasted), all fuels, including electricity, are created from a variety of resources. In some cases, fuels are created from processing other fuels. Electricity generally falls into this group. Some chains are very much more complicated, such as the resource biomass being used to create gas which is used to create electricity which is used to power electric vehicles.

In this context there are three basic sorts of *energy*:

Heat

Light

Movement

9. *Resources* can either be used to create energy directly or to make fuel which can be stored to make energy later.

Resources from which to create fuel or energy include:

coal

crude oil

natural gas

wind

uranium

sun

wave

tide

geothermal

biomass:

- sugar beet
- wheat
- wheat straw
- sugar cane
- rapeseed
- sunflowers
- grass
- miscanthus
- short rotational coppice (willow)
- forest residues
- woody waste
- kitchen waste
- animal waste

food processing waste

waste from bioethanol production

Etc

10. There are many processes for converting a resource to energy and most go through a fuel stage which allows the energy to be stored before being available to be released, although there are some examples where the basic resource converts directly to energy. For example no fuel is needed in a traditional windmill, which converts the wind resource directly into movement of milling wheels. Another example is where anything is burnt and heat is the required result.

11. In most cases the *resources* are converted into *fuels:*

Petrol

Diesel

LPG

Enriched uranium

Bio-diesels including FAME (Fatty Acid Methyl Esters)

Synthetic diesel

Compressed natural gas

Bio-methane also known as renewable natural gas or biogas

DME (dimethyl ether)

Alcohols including

- Ethanol
- Bioethanol including MT/ETBE
- Methanol, also known as wood alcohol

Hydrogen

Bio hydrogen

Electricity:

- From fossil fuels
- From bio-fuels
- From other renewable sources

12. Most of these fuels can be created from a variety of resources. The most environmentally friendly fuels are those using biomass as their resource, and there are various processes to create biofuels. The resulting energy is known as bioenergy.

Thus biomass———————> biofuel———————> bioenergy.

13. The most common processes which are used to convert biomass to biofuel include:

pyrolysis	produces heat and liquid bio-oil fuel
gasification	produces heat and syngas fuel
anaerobic digestion	produces bio-methane fuel
transesterification	produces liquid biodiesel fuel
fermentation and distillation	produces liquid alcohol fuel
combustion	produces high-grade heat which can be used to raise steam, used for making electricity
CHP	produces low-grade heat and bio-electricity

14. Apart from the obvious fuels made from the biomass, other useful products are often created during the process.

Uses for biofuels

15. Just as fossil fuels can be used for a wide variety of applications, the same is true with biofuels, with a variety of different chains. Each biofuel can be used directly for some applications, but need conversion to electricity before it can be used for other applications. The most versatile process for converting biomass to a biofuel is anaerobic digestion as it produces bio-methane which is equally suitable as a vehicle fuel, a source of heating, or to create electricity.

16. From the above it can be seen that the definitions suggested by the EFRA Committee for biomass and biofuels are somewhat misleading.

17. *Biomass* should be defined as all forms of biological matter. This can be found occurring naturally or as specially grown as crops, but are found in greatest quantities in the form of waste. Less than 50% of any food crop grown for human consumption is actually eaten (sprouts are a good example), and of this

edible portion much is wasted (out of date or spoiled food, etc). The human body is not very efficient and much of the food which is actually eaten also ends up as waste, so the overall figure that 85% of any crop grown as food is "wasted" and is actually available as a source of biomass.

18. The current DEFRA definition of biomass refers only to "plant or animal matter used as a source of renewable heat or electricity." The words "source of renewable heat or electricity" should be replaced with the words "source of renewable energy". Energy cannot be restricted to heat and electricity, particularly when electricity is more strictly a fuel than an energy, but should encompass all means of creating heat, light, and movement. The definition "plant or animal matter used as a source of renewable heat or electricity" refers to one process only, combined heat and power. Presumably the EFRA Committee enquiry intends to be wider than just this one process.

19. *Biofuels* should be defined as all forms of fuel, whether gas, liquid or solid which are produced from biomass.

20. The current definition of biofuel refers to "petrol or diesel additives or substitutes produced from crops and other organic material". The phrase is extremely misleading and should be replaced with "all forms of energy produced from biological matter." As explained above biofuels are any sort of fuel created from biomass. The EFRA Committee is probably here referring only to biodiesel and bioethanol. Again, presumably the enquiry intends to be wider than just these two fuels. It should be pointed out that when Mr Diesel invented the diesel engine it ran on 100% bio-diesel and frankly the EFRA Committee definition as "additives" is extremely worrying. That the worst two performing fuels have been singled out for the definition is even more worrying and the NGVA require a full explanation as to why this definition was chosen and by whom.

21. It is not for the government to decide whether a gas, a liquid or a solid fuel should be used, which process should be used, or which biomass resources should be used. All uses should be encouraged. Once each industry is well established, with all the projected improvements in place, and performance figures are available, it will be possible to compare the energy balances and the financial cost.

22. The questions have therefore been re-worded more appropriately.

(Q1)(a) What is the real scope for ~~biomass and biofuels~~ bioenergy to contribute to tackling climate change?

23. The scope is huge, but has never been properly quantified by a thorough and detailed academic study. If organic waste is used as the biomass resource then the contribution to tackling climate change comes from two sources, the saving of methane emissions that would otherwise be released into the atmosphere, and the use of the resulting bioenergy to replace what would otherwise be fossil fuel energy.

24. What is required is a study similar to the EU Well to Wheels Study but quantifying all forms of biomass available. The saving from using cattle slurry and considering just the saving of methane emissions from this one biomass resource resulting from its use to replace fossil fuel, would amount to 14% of the UK's national emissions[34]. Actually, cattle slurry has one of the lowest gas yields of all organic wastes, so when other wastes are considered the figure will be very much higher. For example compared with the gas yield from cattle slurry, the yield from waste fat is 38 times higher and from pastry making is 25 times higher. It will be necessary to obtain figures giving the total quantity and type of the organic waste, residues and by-products emanating from all sources, industry, commerce, domestic, agriculture, horticulture, etc. At present these figures are not readily available and this really useful data would be available if DEFRA were to commission such a study.

(b) What proportion of the UK's ~~energy~~ heat, electricity and transport fuel needs could they provide?

25. Bioenergy would probably provide the UK with 50% of its heat, electricity and transport fuel if the necessary investment was available, but there are so many conflicting figures that it is essential to carry out a properly funded study of the total organic waste available as a resource. In addition to the organic waste a number of appropriate and sustainable crops would be included.

(Q2) How cost-effective ~~are biomass and biofuels~~ is bioenergy in comparison with other sources of renewable energy?

26. It is interesting that this question is so high up in the list. Surely, if the government is serious about improving the environment, then energy efficiency should feature more highly than the financial cost?

27. It is assumed that "other sources of renewable energy" refers to those which do not use biomass as a resource, in particularly those which take energy directly from the sun, moon and wind.

28. The different processes which convert biomass to bioenergy vary in their cost effectiveness. Anaerobic digestion, which produces renewable gas is generally thought to be the most cost effective as it needs less capital equipment, is cheaper to operate, and runs on waste rather than specially grown crops so the operator is paid for both what comes in and what is produced.

[34] Institute of Science in Society, Dream Farm Proposal.

29. The figures for the cost of avoidance of CO_2 equivalent is given in the EU Well to Wheels study[35] as in Euros per tonne of CO_2 avoided compared with oil. This shows:

Bio-methane	130
Fossil natural gas	564
Ethanol from sugar beet	342
Ethanol from wheat using CHP	7,856
Biodiesel using RME	243

30. The equivalent figures for wind energy production are not available, but the British Wind Energy Association quotes figures that the capital cost of wind power is between two and three times that of CCGT capacity. It also shows that carbon dioxide mitigation has been achieved only at a higher cost than that of a combined cycle gas turbine plant until very recently with the high rise in the cost of gas[36].

(Q3) How does bioenergy compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?

31. The EU Well to Wheels study shows very clearly that bio-methane (referred to CBG and biogas in the study) is the only fuel with a favourable fossil energy and GHG emissions footprint. The figures for other processes converting biomass to bioenergy are all available in this study.

32. The study shows that it cannot conclude that the processes for making biodiesel and bioethanol are energy efficient. "Taking into account the energy contained in the biomass resource one can calculate the total energy involved. This shows that biodiesel and bioethanol are several times higher than the fossil energy involved in the pathway itself and two to three times higher than the energy involved in making conventional fuels. These pathways are therefore fundamentally inefficient in the way they use biomass". It also concludes that the GHG balance is particularly uncertain because of nitrous oxide emissions form agriculture.

33. The EU Well to Wheels Study shows in Appendix 1 that much depends on the detail of the resource biomass and the process used and there are no simple answers. Examples from each process show the following well to wheel CO_2 emission equivalents per km:

Biomethane from liquid manure:	−168 (note this is a negative figure)
Fossil natural gas	149
Biodiesel	160
Fossil Diesel	164
Bioethanol from sugar beet	190
Fossil Petrol	196

34. This shows that bio-methane will benefit the environment the most, with fossil natural gas coming second, followed by biodiesel, then fossil diesel, then bioethanol and fossil petrol coming last.

35. This confirms the view of the Natural Gas Vehicle Association that the route that the government should be encouraging is natural gas which is available today, with the aim of moving to bio-methane as soon as possible.

36. It is also worth remembering that natural gas and bio-methane are the most versatile fuels which can be used as vehicle fuel, or to create heat, or to create electricity.

(Q4) Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?

37. Not only are different forms of biomass unequal, but the processes used to convert them into biofuels are also unequal. Different forms of biomass are suitable for different processes. Anaerobic digestion to create bio-methane works best with wet biomass. Combustion obviously prefers dry biomass. Both waste collection and farming practice obviously have an effect on the overall carbon savings, however as the waste has to be collected anyway this is the most favourable form of biomass.

38. It is a known fact that 85% of all food crops become waste, so the need to grow crops specially does not seem particularly necessary in the first instance, particularly given the negative impact on the environment of the current methods of farming some of the energy crops.

39. All forms of combustion to make energy from waste are unsustainable processes in that the nitrogen fertiliser value of the biomass is lost during combustion. Whether the process is incineration, CHP, pyrolysis, gasification or any other process which ends up in burning, if the feedstock contains any nitrogen, which could be used as a fertiliser, its replacement is required and this is achieved by a major input of fossil fuel. The problem is that the energy needed to replace the lost nitrogen fertiliser is often several times the electricity produced by the EfW plant.[37] The electricity cost of replacing the nitrogen plant food in the poultry litter burned can be between six and 21 times the electrical output of the plant.

[35] "Well to Wheels Analysis of Future Automotive Fuels and Powertrains in the European Context" carried out for the European Commission by Concawe, the Joint Research Centre and the European Council for Research and Development.

[36] British Wind Energy Association, Blowing Away the Myths.

[37] Article in Materials Recycling Week 31 Aug 2001, based on research by Land Network and Professor Lynne Frostick head of Waste and Pollution Research Centre, University of Hull.

40. Production of biodiesel and bioethanol are only sustainable when waste is used as the biomass resource rather than specially grown crops. If crops are to be grown specially then it is important that the most sustainable and energy efficient energy conversion process is used. Generally this will be anaerobic digestion for the production of bio-methane. Wheat for instance gives much better value in terms of the overall energy balance if it is converted into bio-methane than if it is converted into bioethanol using the present technologies.

41. Once all the biomass waste has been deployed, then it may be necessary to look at the production of specially grown crops. The production of this biomass needs to be sustainable and without damaging the environment. Sustainable standards need to be set if biomass crops are to be grown specially, possibly looking to the Soil Association for guidelines. The word sustainable must be used in its widest context, not just in terms of energy efficiency. The effect on the soil and particularly the loss of nutrients is most important.

42. Research is being carried out in the EU to determine which crops are best suited to anaerobic digestion under the EU programme Cropgen. One of the most interesting is grass, as this has been shown to be a good source of energy and it would be one of the most acceptable energy crops from the public's point of view.

(Q5) What impact will UK Government and EU actions have in increasing demand for, and production of, bioenergy?

43. The impact (if this means the result, rather than the impact on the environment) will depend on what actions are taken by the UK Government and the EU to increase demand for bioenergy. In the opinion of the NGVA government fiscal action should be to encourage the demand for clean and sustainable bioenergy. Providing this encouragement is long term and guaranteed, this will automatically increase the production and collection of biomass and will enable the different processing industries to develop their technologies.

44. It is well known that the production of bio-ethanol would be likely to become more energy efficient, but the same will apply to all the processes, including anaerobic digestion to produce bio-methane. The larger the market for all these fuels, the more investment there will be to improve the efficiencies of the processes.

45. Provided waste is encouraged to be used as the biomass resource then the impact will be to solve the problem of the country's organic waste problems.

46. Air quality will be substantially improved as well as to provide a clean biofuel.

47. At present, bio-methane is the most attractive option with its positive contribution to the environment and sustainable nature.

(Q6) What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?

48. Bioenergy technologies need a minimal amount of support from the government when compared with the support which would be required for the nuclear industry, but mainly what is required is to have any financial incentives fixed at a set levels for sufficiently long periods so that industry is encouraged to invest. Historically other European countries have given longer term incentives than the UK government. The UK technologies are there, but the investors are hesitant as they need to see a long term fixed financial commitment from the government which at the moment is lacking or totally inadequate.

49. Enhanced capital allowances, fuel duty differentials, and renewables obligations are the classic incentives, but the government should consider other incentives which have already been proved to be effective in other countries. As far as vehicles powered by bioenergy are concerned, the following should be considered:

Free parking with reserved spaces

Special lanes on motorways, normally reserved for high occupancy vehicles

Differential queues for taxis

Fuel rebate for buses, lorries and vans

Vehicle excise duty should be more in line with emissions

Company car allowances should have a greater differential.

50. For example if the government were to reduce the tax on bio-methane, for a long and fixed period, the gas powered vehicle industry would flourish, filling stations would be built, the cars which already exist in the rest of the world in large numbers would become standard, and Britain would catch up with what the rest of the world is already doing. Reducing or eliminating environmentally unfriendly legislation such as the fuel duty rebate which rewarded the dirtiest and most wasteful fuel operators, and replacing this with something which encouraged biofuels would be essential. This particular legislation has lead to the appalling situation where the UK is about the only country in the world that has no new gas buses on order.

(Q7) What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?

51. An increase in "energy crops" to provide a biomass resource, is bound to have a huge negative impact on biodiversity, particularly as many energy crops are not indigenous. Other disadvantages of producing energy crops:

Use of water, which even for UK farming is a significant commodity. One tonne of grain requires at least 1,000 tonnes of water.

Soil erosion as the whole crop is normally used as the biomass resource and is not usually ploughed back into the land to replace the organic material which makes up the soil structure. This means that the soil is either washed away by the rain or blown away by the wind.

Loss of soil nutrients and fertility.

Global warming itself threatens food production, so the land available for food production should be increased not decreased.

Increased use of pesticides and other chemicals.

Increased use of GM crops whose effect on the environment is not yet confirmed to be benign.

52. If energy crops are to be grown, then grass should be favoured over others as its negative impact is less, but it would be far more sensible to use the waste from the existing food crops. Farmers and the food processing industry should be encouraged to process their waste so that it can be used efficiently to create bioenergy and biofertiliser.

(Q8) (a) Does bioenergy production constitute the best use of UK land for non-food crops?

53. It is difficult to compare recreational use of UK land with the growth of non-food crops or the growth of food crops. As explained above, it would be more sensible to use the waste from the existing food crops for bioenergy production, and leave the land for food production and recreational use.

(b) Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass as a resource for producing bioenergy from outside the EU?

54. Neither. There should be no question whatever of importing any biomass while the UK still has enormous quantities of waste which are not being used. One of the principal advantages of using biomass as a resource for biofuels is the security and continuity of supply that comes from a home market.

55. UK and EU policy should focus on using the existing waste. When the stage is reached that this is all being used, but there is still a requirement for more biomass for the production of bioenergy, then native crops such as grass should be grown. It would also be ethically wrong to import specially grown biomass from overseas countries, thus depriving those countries of the chance to create their own bioenergy.

56. The International Energy Agency publication "Renewables for Power Generation, Status and Prospects 2003" says "The most economic forms of biomass are residues. These are the organic by-products of food, fibre and forest production. Anaerobic digestion schemes offer compelling solutions to waste disposal problems and produce bio-methane for energy use and a digestate that can serve as fertiliser or soil conditioner"

(Q9) What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?

57. Government financial incentives such as enhanced capital allowances on equipment to produce bioenergy, duty rebates to encourage investment in all forms of biofuel production with large added incentives for those using waste rather than using specially grown crops as their biomass resource.

(Q10) What lessons can be learned from other countries' experience in the production and use of bioenergy?

58. Strong, clearly defined policy and government leadership is required with declared long term policies signed up to by all political parties which cannot be varied until speculative capital equipment is fully paid for and the technologies are all firmly established.

59. The UK is very far behind the rest of the world in acceptance of natural gas and bio-methane as the cleanest most environmentally friendly fuels whether as a vehicle fuel, for heat or to create electricity. This is entirely due to poor UK government policies such as the Fuel Duty Rebate. When UK policies are good, they are not set for long enough. As an example, the period of three years for a generous duty differential between diesel/petrol and natural gas or bio-methane has been shown to be too short to persuade decision managers or fleet operators to build filling stations and to place orders for new vehicles.

60. Mr Gordon Brown saying he will not give longer than three years for these duty differentials is just not an acceptable reason to ruin the UK's air quality and the nation's health. The same duty differential in Germany was for 16 years and has resulted in commitment to 1,000 gas filling stations being built by 2007 (with around 650 at present), and thousands of gas vehicles being purchased. In the UK three gas filling stations have been closed within the last few months, with no new gas stations being built and no new gas vehicles having been imported.

61. The UK has much to learn from both the developed and the developing countries. For example in Sri Lanka there are 4,000[38] digesters producing bio-methane, however due to lack of continued government support, only 2,000[39] are still operating. In India three million digesters are producing bio-methane and in Sweden more than 50% of the natural gas used is bio-methane and more cities operate on bio-methane than on fossil fuel natural gas. In these towns all the transport and the whole town, including tower blocks, use bio-methane instead of fossil fuel natural gas.

Natural Gas Vehicle Association (NGVA)

February 2006

Memorandum submitted by the Environment Agency (Bio 17)

SUMMARY

1. The Environment Agency welcomes this opportunity to provide written evidence on some of the issues surrounding renewable energy and the role of bioenergy. The Environment Agency is the Government's principal adviser on the environment.

2. We support bioenergy as a renewable source of energy that contributes to limiting climate change and as a part of sustainable development. However, adequate safeguards must be in place to minimise environmental impacts.

3. In considering the role of bioenergy we offer the following comments:

- Whole life-cycle impacts of bioenergy should be assessed including net greenhouse gas emissions, environmental and biodiversity impacts and wider sustainable development contributions. The Environment Agency has developed a tool to enable environmental assessment of different biofuels.
- Incentives such as grants, reduced excise duties or supplier obligations should be focussed on those technologies and fuels with low environmental impact.
- A certification and labelling scheme would enable consumers to choose biofuels with the lowest environmental impact and for any market support to be commensurate with environmental impact.
- A long-term biofuels strategy would clarify what role biofuels can play in a low carbon transport strategy and send important investment signals to fuel suppliers and vehicle manufacturers.
- A Renewable Heat Obligation or a targeted capital grants scheme would encourage wider uptake of bioenergy, beyond the transport sector, and would create a more consistent approach to supporting renewable energy outside the electricity sector.
- Energy from waste has a role in sustainable waste management, provided it does not undermine the prevention, minimisation or recycling of waste. At present most of the waste strategy incentives favour diversion from landfill, but not necessarily towards the higher end of the waste hierarchy, for example, waste minimisation and resource efficiency.
- Co-firing is an efficient form of biomass use, but any support for co-firing should avoid creating perverse incentives, for example to switch from gas to coal generation.
- There is a good case for support for small-scale use of wood fuels meeting the needs of local communities in particular in areas where there are homes off the gas grid or concentrations of fuel poverty.

INTRODUCTION

4. Bioenergy is usually produced from combustion of plant material or organic wastes in the form of biomass or biofuels, such as biodiesel or ethanol. Bioenergy use can reduce fossil fuel pollution and is a form of renewable energy. Whenever fossil fuel is substituted by bioenergy, overall emissions are commonly reduced as each growth cycle, driven by solar energy, takes up most of the equivalent carbon dioxide (CO_2) that is released in combustion and processing.

5. Making bioenergy from waste can avoid the disposal of this waste through landfill or direct incineration. In addition, using waste vegetable oil and fats as fuels is important now that these can no longer be mixed in with animal feed. This can contribute to sustainable waste management, and reduces our dependence on non-renewable energy.

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[38] World Energy Council, Country reports.
[39] *Ibid.*

The Environment Agency Role in Bioenergy

6. Our role in biomass includes regulation of waste and aspects of agriculture, pollution permitting for large biomass plants and as a statutory consultee in the planning system. The permits and consents required for developing a new plant vary depending on the proposal.

7. Producing bioenergy (whether from crops or wastes) requires a range of permits, such as pollution control, and we require developers to work with us to ensure statutory arrangements and planning permission are all in place.

Environmental Impacts of Biocrops

8. Different forms of bioenergy have varying degrees of environmental impact. Our concerns range from large scale changes to land use for energy crops, impacts on water resources, soils, and biodiversity, the handling and reuse of wastes as fuel, and emissions from power stations. Carbon savings are undermined if rainforests are cleared to grow biocrops, fertilisers are used extensively, fuels are transported excessive distances, or if processing plants are powered by inefficient use of fossil fuels.

9. Impacts depend on a variety of factors such as the type of crop, its location and how it is managed. For example, sugar beet and miscanthus are late harvesting crops, which can lead to soil erosion problems that one would see less of with oilseed rape. However, oilseed rape causes problems with nitrate leaching (with losses of approximately 77kg of nitrogen per hectare) that are more serious than for these other crops.

10. The European Commission promotes the use of set-aside land for the growth of bioenergy crops. Taking land out of production and increasing the amount of organic matter contained in soils acts to decrease levels of atmospheric greenhouse gases. Such use could lead to negative environmental impacts. Soils, wildlife and water would need to be suitably protected. It may also increase emissions of carbon. For example, practice has shown that SRC willow grown on set-aside land leads to an increase in CO_2 emissions. In contrast, when SRC willow is grown in place of arable production carbon emissions are shown to decrease.

11. Even where good practice is followed, some areas may not be suited to certain crops. For example, SRC willow is likely to have serious implications for water resources in drought prone areas, but could help prevent flooding by reducing the level of extreme flows. Software is currently being developed by the Centre for Ecology and Hydrology, which should provide information to allow biomass crop impacts on water resources to be modelled more accurately.

12. Ultimately the question of which crops are most suited to which circumstances should be dependent on a full life cycle assessment of the various potential options. This should be supported by growers' code of practice, perhaps based on the guidelines adopted as part of the Energy Crops Scheme.

13. As part of our commitment towards developing sustainable new bioenergy capacity, we have developed the *Biomass Environmental Assessment Tool* (BEAT). It was developed within our science programme to ensure the wider impacts of biomass facilities can be assessed to minimise overall environmental impacts (from areas such as crop production methods and transport) and to maximise sustainable development benefits. BEAT has recently been deployed to all our staff dealing with biomass facility proposals.

Biofuels for Transport

14. Road transport accounts for a growing proportion of UK CO_2 emissions, currently around 22%. Using liquid biofuels in vehicles can cut overall carbon dioxide emissions by replacing fossil fuels.

15. The EU Biofuels directive (2003/30/EC) promotes bioethanol and biodiesel for use in transport. The directive requires each member state to have a suggested target of 5.75% of all petrol and diesel sold by 2010, measured by energy content. Current policy allows for blends of up to 5% by volume (equating to a lower share by energy content because biofuels have lower energy density than fossil fuels). In November 2005 the UK government announced its intention to introduce a Renewable Transport Fuels Obligation (RTFO) which would require 5% of all UK fuel sold on UK forecourts to come from a renewable source by 2010.

16. In the short term there may be enough organic resources to make biofuels even with an expansion in biomass energy at the same time. In terms of energy yield the RCEP[40] argues that heat and power are a better use of the same resource if there has to be a choice. In the long term biofuels will be based on woody biomass with more efficient technologies, so the likely competition for land and crops will have to be assessed and a balance set.

17. Biofuels may be used instead of conventional vehicle fuels or blended with them. In the short-term, blends that work in current vehicle engines are the most practical option, such as bioethanol (5–20%, with petrol).

[40] RCEP: Biomass as a renewable energy source, 2004.

18. Several hundred thousand vehicles running on biodiesel from 100% vegetable oils and animal fats are already in use in Europe. The UK is a long way behind other EU member states—for example, in 2004 the UK produced 9,000 tonnes of biodiesel compared to Germany's 1,035,000 tonnes and France's 348,000 tonnes[41]. Although fossil fuel energy may still be used in production, there is an overall net carbon saving of between 40% and 57% compared to fossil diesel (depending on how the product is produced and shipped). Biodiesel from waste oils is the only biofuel currently in production in this country. Vehicles running on biofuels from waste should not require individual waste permits. However, a long-term biofuels strategy must make clear the regulatory requirements that apply to biofuel production plants.

19. The recent announcement of the government's intention to develop a Renewable Transport Fuel's Obligation should provide a significant boost to the UK biofuel's market. However, a long-term biofuels strategy is needed and should be part of an integrated transport, fuel and energy strategy in the context of climate change. It should also link with rural strategy.

20. For the RTFO and the biofuels strategy we stress the need for sustainability checks being built into the system. We recommend the government:

— protect natural resources affected by expanding the cultivation of biofuel crops at home and abroad by focusing grants and concessions on low impact options.

— introduce a labelling certification scheme that enables buyers at the point of sale confidently to choose biofuels with the lowest overall environmental impact across the whole life-cycle. This must be independent, credible and transparent.

Biomass

21. Despite promotion of both energy crops and recovery of energy from wastes, and incentives to mix biomass with coal, UK progress has been slow. Including wastes, crops, and landfill gas, biomass amounts to 80% of the UK's current renewable energy (including refuse combustion) used as either heat or power. Austria and Scandinavian countries have made most progress with modern biomass energy.

22. A wider life-cycle study of the potential for use of land for the growth of different biomass crops should be undertaken, including the consideration of more complex alternative strategies, such as leaving fields to lie fallow, or using digested sewage sludge to increase the yield of wood crops. We would be happy to design such a study.

23. The permits and consents required for developing new biomass plants vary depending on the proposal. We support small-scale generation where proportionate and risk based environmental standards can be maintained. We would like to see support for small-scale use of wood fuels meeting the needs of local communities, in particular in areas where there are homes off the gas grid or concentrations of fuel poverty.

24. Given the RCEP recommendation that it is better to use biomass resources for heat and electricity we would like to see Government support for biomass heat at least comparable with the RTFO. We urge the government to either follow the RCEP's recommendation to introduce a Renewable Heat Obligation, or the Biomass Taskforce Report's suggestion for a targeted capital grants scheme.

Energy from Waste Biomass

25. It is clear that energy recovery from waste is preferable to incineration without energy recovery. All incinerators regulated by us (those burning over 1 tonne waste/hour) and burning municipal waste, or sewage sludge now recover energy. However, policy on energy recovery from waste must not undermine waste management options that are economically achievable and more environmentally beneficial. The forthcoming update of the waste strategy should secure the potential benefits of energy from waste but only as part of a properly considered integrated waste management strategy, based on life cycle assessment. Any such policy should reflect the relative environmental benefits of waste minimisation, reuse and recycling. At present, the economic incentives to manage waste at these higher levels of the waste hierarchy are weak compared to the incentive to divert from landfill to incineration.

26. Many organic wastes, for example from food processing, are a potential source of energy and we would welcome further research and actions to deliver this potential. Upcoming regulations concerning nutrient additions from spreading manure on fields may restrict the traditional land application recovery route for many nutrient rich organic wastes in the future. We are working with Defra to look for successful and safe ways to spread organics to land in the medium term. Central to this will be agreeing a standard which waste derived organic materials can meet. Other important solutions will be to carefully separate waste at the point of disposal and designing harmful materials out of the organic waste streams.

27. There is an environmental case that burning certain biomass wastes is much cleaner and produces lower emissions of carbon dioxide than burning fossil fuels. However, biomass wastes, like fuels, vary in their threat to the environment. This creates a need for stringent emissions standards and biomass wastes must meet the requirements of the Waste Framework Directive and, in some cases, the Waste Incineration

[41] European Commission: Biofuel Barometer. EurObserv/ER -EEB 2005.

Directive (WID). This is especially so when there is a risk of contamination in the materials used and a consequential potential for environmental pollution (eg municipal waste, clinical waste, sewage sludge and waste wood that has been treated with heavy metals and/or halogenated chemicals). On the other hand, cleaner biomass wastes such as vegetable waste from forestry, agriculture and food processing industry, clean wood, animal carcasses and waste from paper making are not subject to the controls of the WID. We have produced a list of 30 such clean wastes that are exempt from the WID. In order to help the developers of biomass energy, we are planning to produce a simple guidance on the requirements of environmental regulations and how to apply for relevant permissions.

Co-firing

28. Current indications are that the Renewables Obligation is supporting increased interest and investment in the co-firing of biomass in conventional power stations, which promises to provide a significant proportion of the growth in the biomass sector. The main problem from co-firing would arise if it caused coal generation to become more competitive through the RO. This could cause coal with biomass co-firing to displace gas-fired CCGT generation—thereby potentially creating a net carbon emission *increase,* though that would depend on how allowances are allocated in the EU emissions trading regime in future. A large scale uptake of biomass co-firing may also reduce Renewables Obligation Certificates prices and stall investment in other renewables. This would only be acceptable if there was high confidence in the carbon savings arising from biomass co-firing and the award of ROCs for biomass co-firing was commensurate with carbon reductions.

Conclusions

29. The Environment Agency recognises that bioenergy could make a significant contribution to delivering UK and global emissions reductions. However, environmental gains risk being seriously undermined, unless the government introduces measures to ensure low environmental impacts.

Environment Agency

February 2006

Memorandum submitted by the Margarine & Spreads Association (MSA) (Bio 18)

Executive Summary

1. The Margarine & Spreads Association (MSA) fully supports efforts to tackle climate change, but by doing so the most sustainable (from an economic, environmental and social perspective) solution has to be found. A study by RWI[42] (Rheinisch-Westfaelisches Institut fuer Wirtschaftsforschung) shows however that the current focus on a limited number of feedstocks, mainly rapeseed and palmoil, does not constitute the most sustainable way forward.

2. The margarine and spreads sector uses a number of the main feedstocks associated with biodiesel production as a food ingredient. MSA therefore have concerns that by growing non food crops on land previously used to grow food crops it will result in insufficient volumes of edible oil for the food industry. The ingredients of key concern are oils: primarily locally produced rapeseed oil. The 5% blend obligation will create a demand for c. 1m tonnes of biodiesel[43], which exceeds current UK production. The pressure on land space will cause a shortfall in supply which will both push up prices and result in an increase in imports.

3. The RWI study estimates that 13.6 million hectares of land are required for target compliance production in 2010. Given that total arable land in EU is c. 82 million hectares, 13.6 million hectares represents approximately 16.5% of total arable land within EU. This estimate of 16.5% of arable land is substantially higher than compulsory set aside of 10% and therefore the entire biofuel production can not solely take place on set aside land.

4. Given the link between our industry and the use of rapeseed oil for biodiesel we believe that the European Commission and the UK Government must consider the food industry when formulating new biofuel policies. Regulatory impact assessments should be conducted before any new policy is introduced and these should include sections which examine the potential consequences for domestic food manufacturers, both in terms of their food production and the energy they use. In addition, given the global nature of this issue the impacts need to be assessed in a global context.

5. We would also encourage the Commission to recommend more study on the impact of biofuels to the food production chain before setting policy, or creating incentives or targets.

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[42] The RWI study is a meta analysis of research data conducted by Manuel Frondel and Jörg Peters RWI—Essen and funded by the International Margarine Association of the Countries of Europe (IMACE). The study reviews the environmental, economic and land use aspects of rapeseed-based biodiesel.

[43] D1 Oils.

What is the real scope for biomass and biofuels to contribute to tackling climate change? What proportion of the UK's energy and transport fuel needs could they provide?

6. Biomass and biofuel are currently part of a range of solutions to tackle climate change. We would support their use where it makes sense environmentally and provides the most cost-effective option in making a positive contribution to climate change. We would also ask that when conducting a cost benefit analysis of bioenergy that it is undertaken in a global context. There should also be recognition that biofuels are just one of a range of options available to tackle climate change. There are many other effective, inexpensive and less impactful solutions which could be used alone or together to tackle the problem (for example, enhancement of power plants, improving car engines, biomass residues etc).

7. With regard to what proportion of UK's energy and transport fuel needs biomass and biofuels could provide, consideration needs to be given to other demands on land use such as food crops.

How cost-effective are biomass and biofuels in comparison with other sources of renewable energy?

8. Biomass and biofuel can be obtained from several different feedstocks and should be analysed and compared individually. In terms of Greenhouse Gas abatement costs, biodiesel originating from rapeseed oil and bioethanol originating from sugar beats and wheat are more expensive alternatives (£/tonne) for power/fuel generation than many other options such as bioethanol from sugar cane, other biomass (reed, poplar, wood waste) and wind power. In addition, the cost of producing bioethanol from sugar-cane is roughly zero whilst the same matter produced from sugar beat and wheat costs £145/tonne. Thus, these differences have to be calculated and the best economically viable solution applied locally.

9. Another feedstock for biofuel is oilseed bearing trees eg Jatropha and further investigation into their cost effectiveness should be undertaken, particularly given the beneficial contribution such a potentially valuable raw material could contribute to the economies of the developing world where this crop is prevalent. Supply of jatropha would, unlike other biofuels not be competing with demands for it from the food industry. Having reviewed this feedstock and due to its drought resistance and ability to grow on marginal land, it offers the possibility of an economically, socially and environmentally sustainable contribution to energy provision.

10. We would also encourage the European Commission to recommend that the European Committee for standardisation amend the current iodine rules to make more oils eligible for biofuels production—such as sunflower oil. This would also help reduce the pressure on current domestic biofuels, namely rapeseed oil, as well as palm oil.

11. The cost effectiveness of biomass and biofuel needs to be looked at in conjunction with the range of other measures that can take place to reduce CO_2 emissions. Studies have demonstrated that in some situations it is more cost effective to enhance (modernise) old conventional power plants than to use biofuels, with the same or better results in CO_2 abatement. The impact of new car engines consuming less fuel/km, and biofuel/engine improvement are very interesting developments and their cost effectiveness again needs further investigation.

12. Second generation biofuels under development are also promising alternatives and may eliminate some of the disadvantages that biofuel crops produce. In addition, new technologies such as wave and wind power generation should be investigated further for their cost/environmental effectiveness.

13. Overall, there should be further research undertaken to customise solutions which will lead to the most cost-effective and environmentally beneficial outcome.

How do biofuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?

14. Biofuels contribute to carbon saving when compared to fossil fuel, but the extent of this contribution is directly related to its source and characteristics.

15. Currently, higher abatement results when using biomass from wood, poplar, reed and bioethanol from sugar cane. These materials are more efficient in converting carbon. In addition, they will use fewer fertilisers and pesticides and demand less land space.

16. In a study carried out by RWI comparisons of many alternatives to biofuel were made. Please find attached a copy of this research for your reference.

Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?

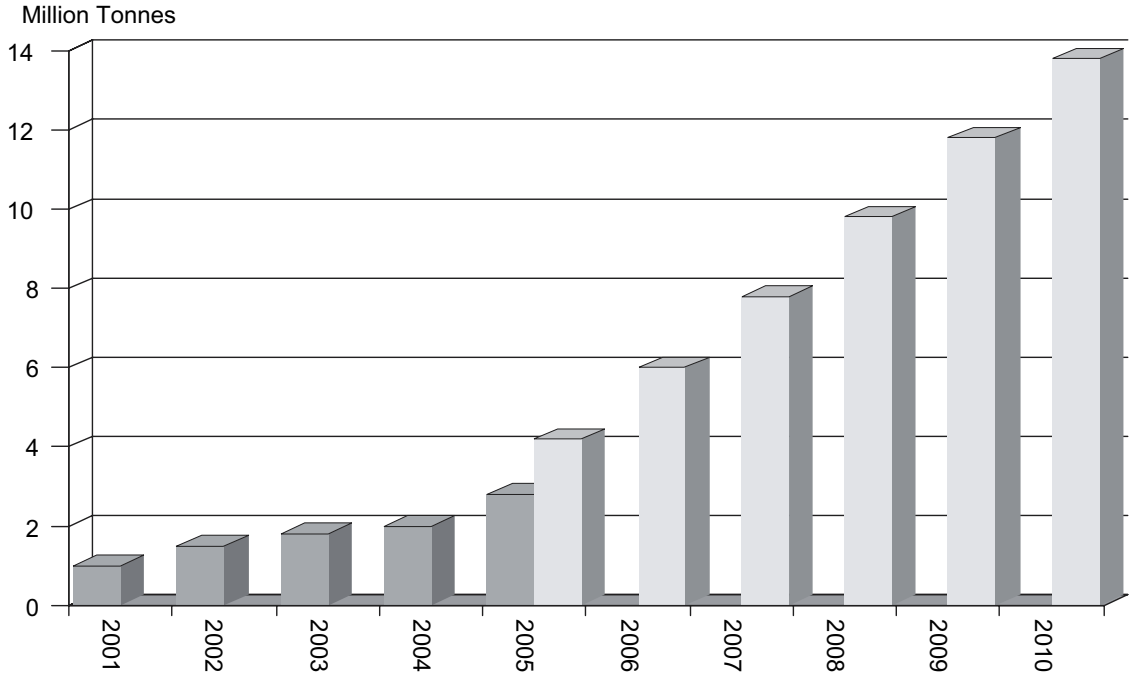
17. In order to assess whether a crop is sustainably produced, the whole life cycle needs to be looked at in a global context.

18. Only research and application of the correct measure for each case and adoption of best practice will guarantee sustainable biomass.

What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and biofuels?

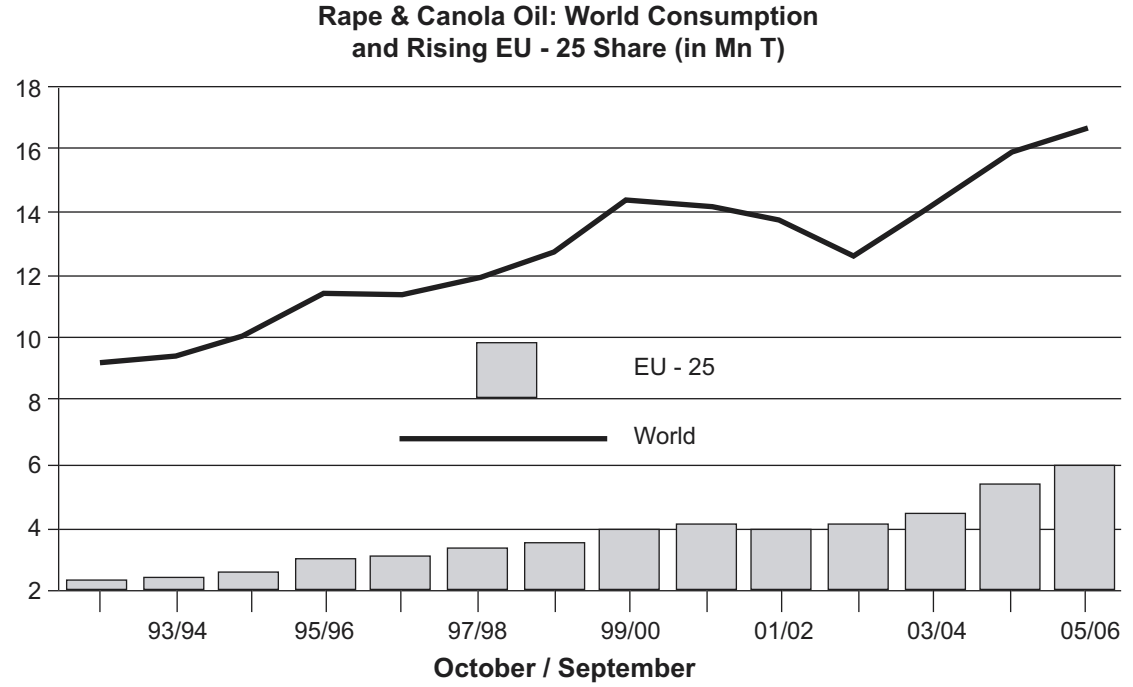
19. The immediate impact is expected to be on land use. Due to the incentives and higher prices on offer to farmers, it is expected that land use will change from food to non food crops. Raw material availability for food purposes is likely to decrease and prices of major agricultural commodities would increase to the point of drastically affecting prices to consumers.

20. The graph below illustrates that based on the target of 5.75% biofuel by 2010, a 2.25 million MT/Year growth in EU-25 biodiesel production for the next five years would be required. Therefore basing this demand on rapeseed oil would have a profound impact on the rapeseed market.



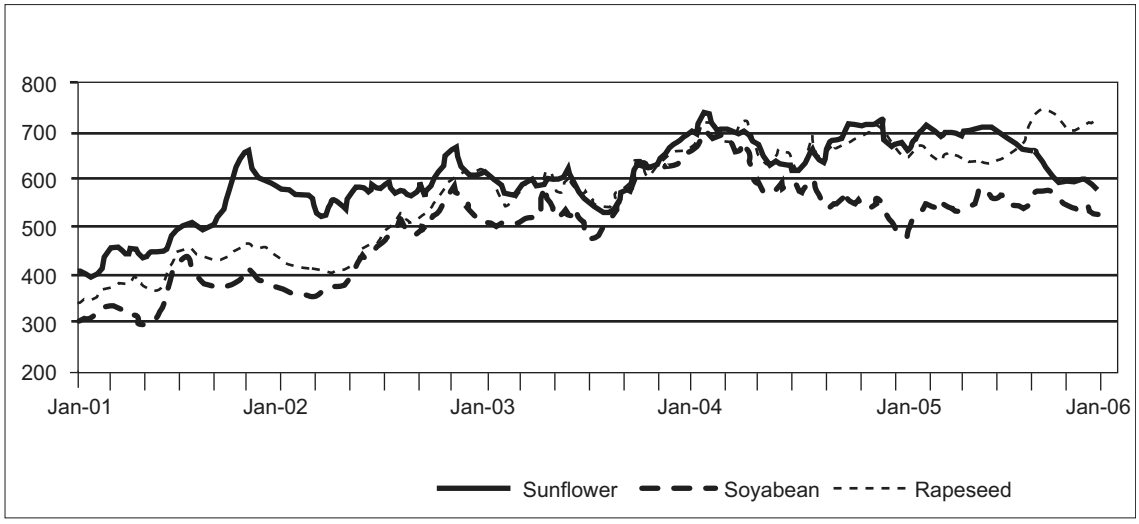
Source: EBB, European Biodiesel Board

21. The graph below illustrates that Rapeseed and Canola oil consumption is increasing both at EU and world level. Therefore, an increase in demand at UK/EU level cannot necessarily be achieved by supply at a global level.



22. In the graph below the impact of the increase in demand for biodiesel has already started to take hold. The price of rapeseed (red) has started to increase dramatically over the last few years and when compared to sunflower in blue and soybean in green rapeseed has continued to rise where they have fallen.

Price for Liquid Oils
(USD/tonne)



Source: Reuters

23. The graph below further illustrates the price increases that have already taken hold. The price of rapeseed is outlined in orange (top line), mineral oil as red (bottom line) and Sunflower as yellow and palm oil as green.

Weekly Palmoil Crude P2 [Line], Rapeoil-Dutch P2 [Line],
S.Oil-Dgummed P2 [Line], BFO 2M Europe [Line]

24. Disruption of the food chain would be serious, as world food production has to date only been able to keep up with demand.

What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?

25. Large scale promotion of biofuels require huge amounts of arable land. Studies have demonstrated that biofuel production cannot solely take place on set aside land (SAL). In fact, to reach the EC target (5.75% biofuel by 2010), almost double the current amount of "SAL" would be required. This would result in competition for land use between food and non-food purposes and as a consequence, an increase in prices.

26. In addition, intensive land usage would require planting on poorer land ("SAL") and therefore demand higher use of fertilisers and pesticides.

Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?

27. In a study carried out by RWI, they estimate that 13.6 million hectares of EU land are required for target compliance production in 2010. Given that total arable land in EU is c. 82 million hectares, 13.6 million hectares represents approximately 16.5% of total arable land within EU. This estimate of 16.5% of arable land is substantially higher than compulsory set aside of 10% and therefore the entire biofuel production cannot solely take place on set aside land. Therefore, other solutions will need to be found.

28. If land is to be used for biofuel production, it is expected that its outcome is the most cost-effective alternative. Studies have demonstrated that European crops (rape seed, beats etc) result in a more expensive and cost-competitive biofuel when compared to other sources (soya, sugar cane, palm oil etc).

29. Research should be carried out to analyse the potential for biomass to be produced locally. Importing cheaper and more cost-effective biomass would be one route, but also raises the question of why not incentivise the use of this matter where it is produced (and thus, save the transportation fossil fuel). Trading systems could be used to stimulate use of biomass where it calculates and we all have to remember that climate change is a global issue to be tackled at a global level, wherever makes most sense.

30. For instance, contributions could be made by enhancing old power generating facilities, improving car engine yield, investing in research for second generation biofuels (where Europe might be more competitive), campaign against waste, invest in new technology (wave and wind generation). In addition, the use of oils from oil bearing trees such as Jatropha should also be investigated to meet the EU requirements.

What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?

31. We would suggest that a map outlining UK's biomass potential is developed and a plan formulated on the best use of this capacity locally, minimising transport and handling. It is also important to set policies to stimulate the development of sustainable and cost-efficient biomass alternatives.

32. Further research would identify key actions that could be taken at a local level. An example of this, is the use of industry and community waste for power generation.

What lessons can be learned from other countries' experience in the production and use of bioenergy?

33. Bioethanol in Brazil is produced at full cost-effective scale: Sugar-cane syrup is extracted for production of sugar or bioethanol (for blending with gasoline as biofuel). The residual liquid sewage can be used as fertiliser for the next crop and the solid remains from crushing is burned to generate power to run the entire facility with excess energy exported.

34. The same kind of approach can be found in ligno-cellulosic facilities. They are able to retro-feed their residues and offset the energy intake.

Margarine & Spreads Association (MSA)

February 2006

Memorandum submitted by the Environmental Industries Commission (EIC) (Bio 19)

1. EIC was launched in 1995 to give the UK's environmental technology and services industry a strong and effective voice with Government.

2. With over 290 Member companies EIC has grown to be the largest trade association in Europe for the environmental technology and services (ETS) industry. It enjoys the support of leading politicians from all three major parties, as well as industrialists, trade union leaders, environmentalists and academics.

3. EIC's Renewable Transport Fuels Working Group includes over 40 companies involved in providing biofuels for transport. Our responses below are, therefore, restricted to a transport biofuels perspective.

Q.1 *What is the real scope for biomass and biofuels to contribute to tackling climate change? What proportion of the UK's energy and transport fuel needs could they provide?*

Q.2 *How cost-effective are biomass and biofuels in comparison with other sources of renewable energy?*

Q.3 *How do biofuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?*

4. The transport sector is responsible for one quarter of the UK's carbon emissions and this is growing rapidly, threatening to derail Government targets to reduce carbon emissions.

5. The technology to produce biofuels is still developing and different feedstocks, both from crops and waste materials/by products, are being developed and used. However, there is ample evidence from Government and independent studies to demonstrate that biofuels are a promising technology for tackling carbon emissions from the transport sector. For example, the report published by DfT in July 2004 "Liquid Biofuels and Renewable Hydrogen to 2050" concludes that "It would be possible, by 2050, to reduce total carbon emissions from road transport to very low levels, through significant use of renewable hydrogen or biofuels. This could help the UK to achieve its goal to reduce CO_2 emissions by 60% by 2050".

6. Whilst it is too early, therefore, to come to a final conclusion on the real potential of biofuels to tackle climate change, or the medium term carbon savings compared to other renewables, it would be a huge mistake to fail to support the development of a promising technology that is already achieving significant market share in many countries.

7. The question of the cost-effectiveness of biofuels depends on a wide variety of factors including: the price of fossil fuels; whether environmental costs are integrated into the costs of fuels; and the efficiency savings to be gained as we move into mass production. However, EIC Members in the biofuels sector are successfully convincing investors that they have the potential to compete on cost with alternatives, including fossil fuels, once well established.

Q.4 *Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?*

8. There are a range of feedstocks and process for biofuels which have different carbon saving and overall sustainability benefits. EIC believes that Government should give greater support to those biofuels which have the greatest benefits. In assessing these benefits it is important that the Government gives due weight to wider sustainability considerations as well as carbon savings. Otherwise the Government may promote fuels which are produced in such a way as to run contrary to its environmental policy objectives in areas such as biodiversity (for example through encouraging deforestation).

9. EIC, therefore, supports a sustainability certification system being introduced as part of the Renewable Transport Fuels Obligation (RTFO). This system should:

- Be simple, so that the costs are not disproportionate.
- Recognise the whole supply chain, and not, therefore, disadvantage UK production where more stringent standards may be applied than in the case of some imports.
- Initially be in the form of compulsory reporting, but quickly lead to a banded system, directly tied to obligation compliance.

10. Such a scheme will be much more effective if the standards it sets can be applied across the EU.

Q.5 *What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and biofuels?*

Q.6 *What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?*

11. EU policy through the Biofuels Directive does not set mandatory levels for biofuel use and, is therefore, of limited effectiveness as driver. It has, however, set out a framework and ensured the UK Government looks seriously at measures to increase use of biofuels.

12. The principal policy measures to increase demand for biofuels lie in the hands of the UK Government.

13. The duty differential of 20p per litre introduced for biofuels has had some impact in stimulating the production and use of biofuels. However, this is not sufficient for biofuels to become a significant part of the fuel supplied at the pump. EIC has, therefore, supported the introduction of a RTFO and continues to discuss regularly with DfT, Defra and Treasury the details of such a scheme. EIC has put forward the following as key features of the scheme it believes are necessary to support biofuels:

- RTFO targets of 3/4/5% for 2008/9/10.
- RTFO targets to rise consistently beyond 2010 subject EU fuel specifications.
- A buy out price of 30ppl.

— Duty derogation of 20ppl from April 2008 to April 2009.

— A significant overlap between the duty derogation and obligation regimes.

— No implied increase in duty contribution from Treasury beyond 2008.

14. EIC has also consistently called for the RTFO to be introduced earlier than 2008 if it is to make a real contribution to meeting the UK's target for reducing CO_2 emissions by 20% by 2010.

15. We would be happy to supply the Committee with a more detailed paper on the RTFO.

16. The other key area for EU and UK policy is addressing the restriction on using more than 5% biofuel in regular fuel supplied at the pump. It is vital that the EU moves quickly to ensure the relevant standards allow a higher level of inclusion.

Q.7 *What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?*

17. Growing energy crops for biofuels has the potential to have numerous local environmental, social and economic impacts. Energy crops, for example have the potential to provide an incentive to keep land in productive use following the changes to the Common Agricultural Policy to de-link subsidy from production.

18. It is, therefore, vital that the Government uses the policy mechanisms at its disposal to ensure energy crops have a positive impact. In particular the sustainability criteria integrated into the RTFO will be central to ensuring energy crops have beneficial impacts.

Q.8 *Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?*

19. In a global market it is not possible for the UK or EU to ban imports of biofuels or the feedstock for their production.

20. However, in a rapidly developing area with potential for supply shortages, significant domestic production is going to be essential to ensure security of supply. UK and EU policy should, therefore, focus both on encouraging demand for all biofuels that are demonstrated to contribute to sustainability and on encouraging domestic capacity as part of the supply of those biofuels.

Q.9 *What more can be done to make more efficient use, as an energy source, of the by-products of agriculture and forestry (eg wood waste and other organic waste)?*

21. There are promising technologies for using by products/waste from agriculture, forestry and general biodegradable wastes for producing biofuels. Indeed, the principal feedstocks for biodiesel currently produced in the UK are used cooking oil and tallow.

22. Waste and by product feedstocks will score highly on carbon savings and sustainability considerations and the key to encouraging them will be providing greater levels of incentive through the RTFO for fuels that score highly in these areas.

23. Government will also need to address the regulatory hurdles that can result in by products being considered waste and therefore subject to the rigours of a waste management licensing system principally designed for those running landfills. EIC is pressing at both EU and UK level for action to tackle the problems caused by the wide application of the definition of waste—whilst ensuring that the potential environmental impacts are properly controlled.

Q.10 *What lessons can be learned from other countries' experience in the production and use of bioenergy?*

24. EIC has experience of the policy framework required to promote environmental technologies across a wide range of areas and countries.

25. The key feature that emerges from this is the need for policy to stimulate demand by correcting the market failures that allow for more polluting technologies to dominate. This then allows the market to respond and to deliver innovative and effective solutions. These are invariably more effective than supply side measures.

26. The main risk seen by investors to developing environmental technologies to respond to Government policy is that of "Government failure" ie that the policy framework will not be kept in place for sufficient time or that policy will change.

27. It is, therefore, vital that the policy framework is consistent and long term as investors require clarity that measures to stimulate demand will remain in place for a sufficient period to allow them to have the possibility of making a return on their investment.

The Environmental Industries Commission (EIC)

February 2006

Memorandum submitted by D1 Oils plc (Bio 20)

Background on D1 Oils PLC

1. D1 Oils plc is a UK-based global producer of biodiesel from renewable energy crops.

2. We are building a global supply chain and network that is sustainable and delivers value from "earth-to-engine" via:

- Agronomy—the science, planting and production of crude vegetable oils.
- Refining—the designing, building, owning, operating and marketing of biodiesel refineries.
- Trading—the sourcing, transport and trading of seeds and seedlings, crude vegetable oils and biodiesel.

3. Our primary feedstock is *jatropha curcas*, a tree that grows widely in the developing world. Jatropha seeds produce high yields of non-edible vegetable oil that can be refined into biodiesel. D1 selected jatropha for its productivity, longevity and ability to grow in the poor soil conditions often found in developing countries. We are building a global supply chain to harvest jatropha oil from D1 plantations across the developing world, refine jatropha and other vegetable oil feedstocks into biodiesel using our proprietary refinery technology, and to source, trade and transport crude vegetable oils and biodiesel to market.

Executive Summary

4. The introduction of a 5% biodiesel blend under the RTFO will require around 1m tonnes of biodiesel by 2010. D1 Oils has already invested significantly in both upstream planting of energy crops in developing countries to produce biodiesel feedstock, particularly jatropha curcas, and downstream refining technology. We believe that this investment will enable us to supply a proportion of the 1 million tonnes required from our own feedstock supplies by 2010 and to supply further demand should the government introduce a higher level of obligation.

5. Research undertaken with the cooperation of D1 indicates that the production of jatropha derived biodiesel has a primary energy requirement of slightly less than Used Vegetable Oil (UVO) and 40% that of rapeseed methyl ester (RME). Even when the energy required to ship jatropha biodiesel from developing countries where it is produced to the UK where it is consumed requires a lower primary energy requirement and results in lower GHG emissions than RME. Importing jatropha feedstock to the UK does not therefore create an unacceptable energy or emissions balance.

6. We fully support the creation of an environmental assurance scheme as proposed under the RTFO to demonstrate sustainability of supply. In jatropha we have an energy crop whose environmental impact is positive.

7. D1 welcomes the government announcement of the RTFO. We see this as a significant encouragement to the UK biofuels industry, whether the feedstocks come from domestic sources or overseas. A decision on the next step up of the target in terms of a higher percentage and a firm date for the increase would be of benefit to the industry.

8. Currently the biofuels industry in the UK is small and by definition the commercial players in the sector are often small, entrepreneurial operations. Given the need to bring these growing businesses to profitability as soon as possible, the industry requires subsidies from the government and the fuel rebate of 20ppl has been a significant enducement to investment. However, a higher level of rebate would provide stronger encouragement.

9. UK agriculture can produce a significant proportion of the UK's demand for biodiesel and bioethanol. However, as note above, it will be impossible to meet all demand from domestic agriculture. A mix of home production and imports will be needed.

10. Importing jatropha feedstock from the developing world offers greater security of supply to the UK in terms of energy supply while benefiting considerably the agricultural sectors of developing countries.

D1 Responses to Specific Issues

Q1. *What is the real scope for biomass and biofuels to contribute to tackling climate change? What proportion of the UK's energy and transport fuel needs could they provide?*

11. The introduction of a 5% biodiesel blend under the RTFO will require around 1m tonnes of biodiesel by 2010. This effectively springboards the UK biodiesel market to a level where significant investment in feedstock and refining technology is now attractive. D1 Oils has already invested significantly in both upstream planting of energy crops in developing countries to produce biodiesel feedstock, particularly jatropha curcas, and downstream refining technology for use in the UK and for export.

12. Jatropha is an energy tree crop that has the necessary characteristics to become a major biodiesel feedstock:

- Potential for high yields—up to 40%.
- Outside food chain: not an edible oil.
- Grows on non arable land—no threat to food crops.
- Hardy and long life span—up to 30 years.
- Oil characteristics favourable for biodiesel.
- Useful byproducts, eg seed cake for fertiliser.

13. We believe that this investment will enable us to supply a proportion of the 1m tonnes required from our own feedstock supplies by 2010 and to supply further demand should the government introduce a higher level of obligation.

14. D1 is working on planting up to 250,000 hectares of marginal or waste land in India and Africa during 2006. If our projections for the development of jatropha yields prove correct, this amount of land should be able to produce around 675,000 tonnes of biodiesel, enough to meet over 50% of UK demand. D1 aims to plant at least 250,000 hectares each year beyond 2006. Although a considerable portion of the vegetable oil and biodiesel we produce will be consumed in the countries where the crops are planted, we will be in a position to supply through imports a significant proportion of an RTFO of 5% and above.

Q2. *How do biofuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle?*

15. When compared with other renewable transport fuels in terms of life cycle primary energy inputs, biodiesel compares favorably with bioethanol. Biodiesel required energy inputs of 1.6MJ/km compared to 2.3MJ/km for bioethanol and 2.0MJ/km for electric vehicles ("Alternative Road Transport Fuels—A Preliminary Life Cycle Study for the UK", Report ETSU-R-92, Vol 2, ETSU, Harwell, UK, March 1996).

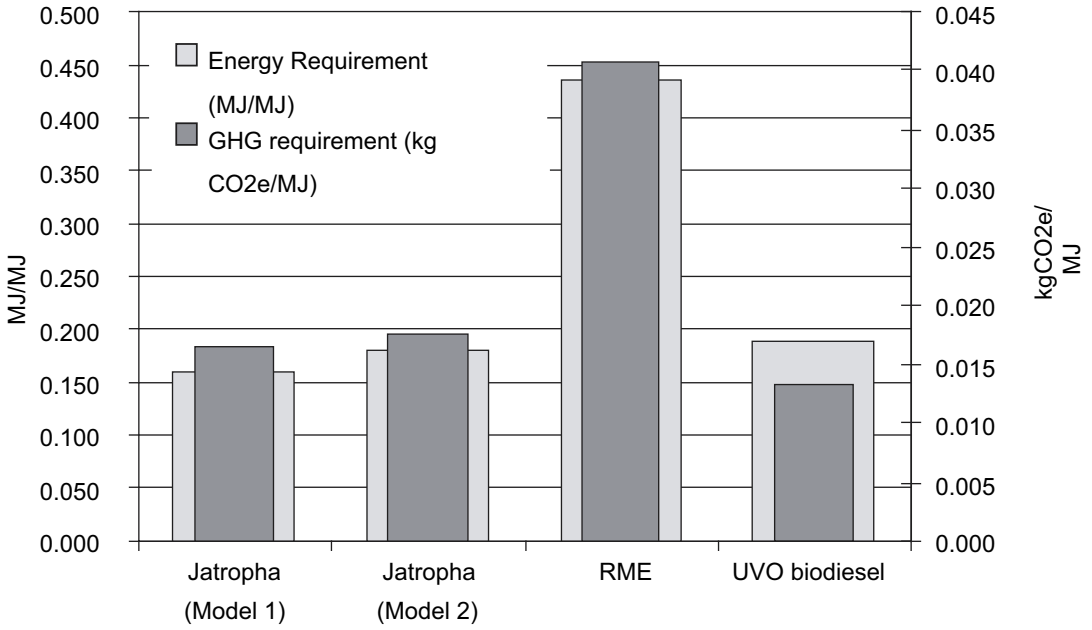
16. It is recognised that manufacture of fossil-based diesel uses less energy than the manufacture of biodiesel. This is because the conversion of ancient animals and plants into oil and coal with high calorific value has already been largely completed by millions of years of geology. Therefore we should revise the comparison to include calorific value of fossil-based fuels in the energy balance on the grounds that this energy is supplied from a finite resource. The energy content of renewable fuel does not deplete a finite resource and so should be omitted from the energy balance.

17. Biodiesel has energy by volume of 35.6 MJ/L, which compares favourably to mineral diesel at 37.9 MJ/L. In comparison, petrol has an energy content by volume of 31.5 MJ/L and bioethanol has an energy content by volume of 21.1 MJ/L.

18. Research undertaken with the cooperation of D1 indicates that the production of jatropha derived biodiesel has a primary energy requirement of slightly less than Used Vegetable Oil (UVO) and 40% that of rapeseed methyl ester (RME). This is primarily due to the difference in agricultural processes. Jatropha does not require inputs of nitrogen-based fertiliser and rape production in the UK is significantly more energy intensive than jatropha production in for example India. Jatropha production relies less on mechanised agricultural practices and the trees remain standing for up to 30 years, whereas rapeseed is an annual crop. (Tobin, 2005. "Life Cycle Assessment of the production of biodiesel from Jatropha", University of Reading.)

19. The table below shows the energy and greenhouse gas (GHG) assessment of jatropha biodiesel when compared to RME and used vegetable oil (UVO).

Figure A: Well-to-Tank Primary Energy and GHG Assessment of Jatropha biodiesel



20. The different models demonstrate the impact on energy and GHGs of importing Jatropha feedstock from developing countries to Europe. Model 1 represents production and local use. Model 2 adds costs of shipping to Europe. Even when the energy required to ship jatropha biodiesel from developing countries where it is produced to the UK where it is consumed requires a lower primary energy requirement and results in lower GHG emissions than RME. The improvement in primary energy use is so great that the energy requirement for shipping (/t km) would need to be increased in the region of 800% to reach the lifecycle energy requirement of RME.

21. Importing jatropha feedstock to the UK does not therefore create an unacceptable energy or emissions balance.

Q3. *Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?*

22. We fully support the creation of an environmental assurance scheme as proposed under the RTFO to demonstrate sustainability of supply. In jatropha we have an energy crop whose environmental impact is positive:

— Jatropha does not require arable land.

— Jatropha can reclaim waste and depleted land.

— Jatropha can assist in arresting desertification.

23. Jatropha can also be intercropped with other agricultural crops, and need not result in monocropping. Because jatropha does not require arable land, it can be grown on land that is already waste, unused, marginal or degraded and should not result in deforestation. Jatropha is a sustainable biodiesel feedstock that can produce surpluses for developing countries to export to the developed world.

24. As our operations get underway, we will be in a position to demonstrate the sustainability of jatropha planting on a large scale.

Q4. *What impact will UK Government and EU actions have in increasing demand for, and production of, biomass and biofuels?*

25. D1 welcomes the government announcement of the RTFO. We see this as a significant encouragement to the UK biofuels industry, whether the feedstocks come from domestic sources or overseas. The target effectively creates a market overnight and is encouraging investment. However, the UK remains well behind France and Germany in the levels of biofuels currently used within the economy, and we note that the current announced level of a 5% RTFO by 2010 still falls below the 5.75% recommended by the EU Fuels Directive. A decision on the next step up of the target in terms of a higher percentage and a firm date for the increase would be of benefit to the industry.

Q5. *What level of financial and policy support do bioenergy technologies require in order to achieve the Government's targets for renewable energy?*

26. Currently the biofuels industry in the UK is small and by definition the commercial players in the sector are often small, entrepreneurial operations. D1 is such a business, having been floated on the Stock Market in 2004. Given the need to bring these growing businesses to profitability as soon as possible, the industry requires subsidies from the government and the fuel rebate of 20ppl has been a significant enducement to investment. However, a higher level of rebate would provide stronger encouragement. The industry is starting from a low base and needs support. Germany for example exempts biofuels from duty altogether.

27. As noted above, the RTFO has created the beginnings of a market. However, if the RTFO ends up replacing the rebate the impact on the industry will be negative.

28. Enhanced capital allowances (ECAs) are unlikely, given the existing structure of the industry, to encourage further investment. They favour companies entering the market who have existing profitable operations to offset the allowances against rather than focused start-up biodiesel companies who have existing tax losses to absorb. We do not therefore regard ECAs as a significant means to stimulate the industry. We would see regional grants as a more effective means to stimulate the deployment of refining capacity.

29. From D1's point of view, the bulk of our refineries will in the long term be operating overseas, therefore the impact of ECAs for D1 will be limited. Furthermore, the extremely high environmental and technical standards that are required for refining production in the UK could prove too costly to implement in developing countries who require rugged technology that will operate in remote areas.

Q6. *Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?*

30. UK agriculture can produce a significant proportion of the UK's demand for biodiesel and bioethanol. However, as note above, it will be impossible to meet all demand from domestic agriculture. A mix of home production and imports will be needed.

31. Importing jatropha feedstock from the developing world offers greater security of supply to the UK in terms of energy supply while benefiting considerably the agricultural sectors of developing countries.

32. D1's initial operations indicate that jatropha offers significant potential to benefit developing economies developing world:

Q7. *Benefits to agriculture in the developing world*

- Jatropha planting will stimulate rural agriculture—agriculture can provide the scale of growth that many developing countries, particularly in Africa, require to stimulate economic growth.
- Every 5,000 ha of jatropha creates 4,000 jobs—planting 1,500/maintenance 2,500. (In the UK one job is created for every 20 hectares of biofuel crop.)
- New cash fuel crops can be grown on marginal, waste and unused land.
- Redundant cash crops, eg coffee in East Africa, can be replaced with jatropha.
- Jatropha can be intercropped with existing crops.
- Refinery operation will transfer skills and technology.

Q8. *Benefits to energy use in the developing world*

- Additional planting ensures local supplies of less polluting biodiesel
- Reduced dependence on imported fossil fuel.
- Enhanced energy security based on diversity of supply.
- Improved energy efficiency:
  - Local biodiesel production for local transport use.
  - Local biodiesel production for off-grid electricity generation.

Q9. *Environmental benefits for developing countries*

- Significant reduction of fossil fuel consumption.
- Increased use of biodiesel will improve air quality.
- Lower GHG emissions.
- Potential for land remediation and reclamation:

— Arresting desertification.

— Restoring depleted soils.

— Potential to earn CDM and Carbon Credits to sell to developed countries.

D1 Oils plc

February 2006

Memorandum submitted by Friends of the Earth Ltd (Bio 23)

SUMMARY

0.1 Friends of the Earth believes that bio-energy can make a significant and important contribution to tackling climate change. A sustainable supply could include both domestic production and some imports. This could bring economic benefits and jobs and reduce greenhouse gas emissions whilst protecting and even enhancing biodiversity and environmental quality.

0.2 However, biomass production can cause a range of adverse environmental and social effects. These impacts, and the benefits of bio-energy for emissions reduction, depend very much on the biomass used and where and how it is produced. It is therefore essential that all policy measures to support bio-energy are accompanied by strong certification schemes to ensure emissions reductions are achieved and adverse effects minimised. Given that the sustainable supply is limited, it makes sense for policy to encourage biomass to be used as efficiently as possible.

Q1. *What is the real scope for biomass and biofuels to contribute to tackling climate change? What proportion of the UK's energy and transport fuel needs could they provide?*

1.1 Friends of the Earth, for the last ten years, has championed the environmental space approach to ensure a fair allocation of natural resources and a respect for environmental limits, so that natural resources are preserved for the future. This approach is useful in determining the scope for biomass and biofuels to contribute to tackling climate change.

1.2 The Committee is hopefully familiar with the per capita approach to the allocation of emissions permits for carbon emissions—whereby a country's fair share of the sustainable level of global emissions is considered to be proportional to the country's share of global population. A similar approach can be adopted for bio-energy. In this case, the operative limit for the consumption of bio-energy is the amount of land that can be allocated to the production of biomass, once sufficient land has been given over to food production, the preservation of biodiversity and other essential uses. Measures of output using sustainable techniques can then be combined with the assessment of land availability to estimate the sustainable level of biomass production. Extra biomass can be added from waste arising from forestry, municipal trees and some crops to give an overall total. Assessments of this kind have been carried out globally by the German Advisory Council on Global Change (WBGU)[44] and for Europe by the European Environment Agency.[45]

1.3 Friends of the Earth has carried out rough calculations of the sustainable UK consumption, based on the assumption that we could ethically import biomass up to the level at which we consume a share of global or European production equivalent to our share of global or European population minus an allowance for the energy consumed in producing and transporting the biomass. This allowance we set, somewhat arbitrarily, at a third. These calculations suggest to us that the UK may be able to consume between 132–182 terawatthours (TWh) of energy from biomass every year. For comparison purposes, the UK currently uses about 400 TWh of electricity alone (and more than 700 TWh for heat). Use of this biomass for energy would make a significant and important contribution to our energy needs. In order to maximise its impact, policy measures must ensure that it is used as efficiently as possible.

1.4 We do not make any special claims for the accuracy of these calculations and would not be surprised if more sophisticated variants of them doubled the sustainable supply. However, we believe the principles behind them are right and that more sophisticated calculations based on these principles should be an important input into Government policy-making. However, none of the assessments we have seen of the UK's biomass potential, including that of the Royal Commission on Environmental Pollution, do this. There is an urgent need for the calculations to be done.

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[44] German Advisory Council on Global Change (WBGU), 2003 "World in Transition: towards sustainable energy systems" pp 56–62 http://www.wbgu.de/wbgu_jg2003_engl.html

[45] European Environment Agency, 2005 "How much biomass can Europe use without harming the environment" EEA Briefing 02 http://reports.eea.eu.int/briefing_2005_2/en/briefing_2_2005.pdf

Q2. *How cost-effective are biomass and biofuels in comparison with other sources of renewable energy? How do biofuels compare to other renewables, and with conventional fossil-fuels, in terms of carbon savings over their full life-cycle? Not all biomass is equal—potential carbon savings depend on, for instance, farming practice. What can be done to ensure energy crops are sustainably produced?*

2.1 The key point we would emphasise in answering these questions is the wide variation in costs, carbon savings and ancillary impacts between different sources of biomass and between different uses of biomass and biofuel.

2.2 This variation represents both an opportunity and a threat. On the one hand, the complex variation in costs suggests that Government policy should allow market mechanisms to determine which sources of biomass are used and to what ends they are put. On the other hand, the wide variation in carbon savings (and in other environmental and social impacts) suggests that market mechanisms alone will not be capable of ensuring maximum carbon savings and minimal adverse social and environmental impact.

2.3 We therefore believe that mechanisms to promote the use of biomass (eg the Renewables Obligation, the Renewable Transport Fuel Obligation) should:

— directly target, in so far as is possible, reductions in greenhouse gas emissions, calculated on a whole life-cycle basis;

— be accompanied by a strong and mandatory accreditation scheme to minimise adverse social and environmental impact.

2.4 A key concern is WTO-compatibility. We understand WTO rules prohibit the use of controls or incentives to regulate how imports are produced. However, such controls would be inherent in any scheme to target incentives toward reductions in life-cycle emissions and in any strong and mandatory accreditation scheme.

2.5 The success or failure of attempts to ensure energy crops are sustainably produced therefore depends on the extent to which life-cycle incentives and the accreditation scheme can be made WTO-compatible or on the extent to which WTO rules can be ignored.

Q3. *What impact might an increase in energy crops in the UK and the rest of the EU have on biodiversity, production of food crops and land use and the environment more generally?*

3.1 Measures currently planned by the UK Government, if modified to directly incentivise reductions in life-cycle greenhouse gas emissions and accompanied by a strong and mandatory accreditation scheme, could lead to the development of a sustainable biomass and biofuels industry.

3.2 Much of that industry is likely to be located inside the European Union, although there may be some imports. This will bring economic benefits and jobs and reduce greenhouse gas emissions whilst protecting and even enhancing biodiversity and environmental quality. The land take required is not likely to have a detrimental effect on food production. More measures could also be introduced to increase use of waste biomass (eg from forestry) and promote the growth of energy crops, especially to generate heat, without adverse consequences for biodiversity or the environment more generally.

3.3 However, in the absence of direct incentives to cut emissions and a strong and mandatory accreditation scheme, UK Government and EU actions are likely merely to encourage supply from the cheapest sources. This is likely to lead to production from intensively farmed rape and grain in the European Union, using energy-intensive fertilisers that pollute water courses and add to nitrous oxide emissions. It is likely also to lead to imports of soy and palm oil from tropical countries, causing deforestation which in turn would damage biodiversity, increase carbon emissions and undermine livelihoods of local people who depend on the forest.

Q4. *Does bioenergy production constitute the best use of UK land for non-food crops? Should UK and EU policy focus on increasing domestic production of energy crops and biomass, or are there merits in importing biomass for energy production, or raw feedstock or refined biofuel, from outside the EU?*

4.1 Climate change is the most pressing environmental issue facing humanity. Hundreds of millions of people, including many of the poorest people in the world, could lose their lives or livelihoods if average temperatures rise as forecast. Up to one million species of animal and plant could be committed to extinction. Action to prevent climate change is an economic, social and environmental imperative.

4.2 Bio-energy production has a significant and important contribution to make, alongside other policies, in ensuring UK emissions fall by 3% per year and by 60–80% by 2050.

4.3 The analyses we have done suggest that while the UK and the EU should focus primarily on increasing domestic production of energy groups and biomass, there is scope for importing biomass from outside the EU. These could include imports from elsewhere in the developed world (eg Russia, Canada) and from developing countries. There is nothing inherently wrong with this.

4.4 If incentives are designed to reduce greenhouse gas emissions throughout the life-cycle and accompanied by a strong and mandatory accreditation scheme, these imports could help facilitate sustainable development in the producer countries.

4.5 However, in the absence of incentives designed to reduce greenhouse gas emissions throughout the life-cycle and strong and mandatory accreditation scheme, there are serious risks in promoting imports, especially from developing countries:

- developing countries do not have targets under the Kyoto Protocol. There is no incentive on them to ensure that biomass production doesn't lead to increased carbon emissions as a result of deforestation or inefficient energy use.
- developing countries are home to hundreds of millions of people on very low incomes who depend on forests and other natural habitats, but who have no secure title to the lands on which they depend. There is a very real risk that land might be appropriated from them for biomass production.
- many developing countries contain hotspots of global significance for biodiversity that could be damaged for biomass production.

4.6 The experience we have seen already with palm oil production in South East Asia and soy production in South America strongly bears out these risks. It emphasises the need for incentives to be based on life-cycle emissions and for a strong and mandatory accreditation scheme.

Friends of the Earth Ltd

February 2006

Memorandum submitted by WWF (Bio 28)

INTRODUCTION

1. The power and the transport sector are major contributors to the UK's carbon dioxide (CO_2) emissions. If the UK is to play its part in cutting CO_2 emissions in line with keeping the global average temperature below a 2°C increase compared with pre-industrial levels—a widely recognised "tipping point"—then a radical shift is needed in the UK and globally. As well as greatly improving our energy efficiency and reducing demand for energy, there must be a switch from polluting to clean fuels, for the UK's heat, electricity and transport needs.

2. Modern and carbon-neutral biomass fuels[46] have the potential to become a key source of electricity and heat in the next 20 years.[47] Compared to the intermittent renewable energies, such as wind and solar, biomass fuels offer the advantage that they can be stored and therefore used when needed. This increases the application of biomass fuels as a valuable alternative to replace coal in power plants, especially if domestic micro-generation and CH/CHP schemes are properly supported and built. Also, a reasonable amount (5–10%) of oil in transport fuels could be replaced with bio-fuels too.

3. Research shows that there is an opportunity for OECD countries to generate up to 15% of their electricity requirements from sustainable biomass sources by 2020.[48] Therefore, the potential global contribution of bio-energy in 2050 could be substantial, with an input estimated at 50%.[49] Supporting the sustainable production and use of biomass is also important for many communities in developing countries, as many still aren't on conventional electricity grids and so rely on the unsustainable use of firewood, dung and inefficient cookers for heat, which have been linked to significant environmental and health problems.

4. However, much more research is required regarding the growing of bio-energy crops in order to ensure vulnerable eco-regions are protected, as they may become at risk from expanding bio-fuel production outside Europe, if robust safeguards and whole life-cycle, worldwide footprint criteria are not applied as standard. The eco-regions at most risk from exploitation are probably those located in low-cost producing countries like Brazil, Zambia and Australia.

5. Hence, while increasing bio-energy use can help reduce greenhouse gas emissions, if not properly supported, safeguarded and managed it could threaten the conservation of forest, freshwater and coastal ecoregions that are priorities for WWF.

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[46] *Biomass* refers to all types of fuel, both solid and liquid, from biological materials whereas *bio-fuels* are liquids such as ethanol (from crops like sugar) or biodiesel (from oil crops like rape seed and oil palm).

[47] This paper focuses on modern bio-energy uses, eg conversion of biomass in heat, electricity or transport fuels through an industrial process.

[48] Bauen *et al,* 2003, Bio-Power Switch: a blueprint for achieving 15% of electricity from biomass in OECD countries by 2020, Imperial College London and E4tech Consulting, available on www.panda.org/climate.

[49] UNDP, UN Department of Economic and Social Affairs, World Energy Council, 2000, World Energy Assessment.

THE ROLE AND SCOPE OF BIO-ENERGY IN CONTRIBUTING TO THE ENERGY MIX

(i) When creating an economic level-playing field, biomass fuels are cost-effective and easily accessible sources of energy to replace fossil fuels.

(ii) At present preference should be given to the use of energy crops in highly efficient combined heat and power production or in direct heating. These applications offer a greater carbon saving than using this valuable and finite resource to produce electricity alone or for transport fuels. Indeed, processes to produce biofuels for transport are often energy intensive, significantly reducing the net carbon benefits.

(iii) Currently, bio-electricity represents about 1% of the electricity production capacity in OECD countries, with an installed capacity of about 18.4GW. Most bioelectricity production in OECD countries is associated with forestry and wood processing industry activities.

(iv) Most plants are of the combined heat and power type and are based on a variety of combustion technologies, where the heat produced is generally used for industrial process heat or district heating. Some countries, such as Finland, have considerable experience with co-firing biomass with fossil fuels and waste.

(v) Bio-fuels are a rapidly growing industry: exports of ethanol increased by 21% from 1990–2002; Brazil's ethanol exports grew $\sim$1000% since 2000, and EU production of biodiesel grew 81% since 2002.

(vi) Pressure for a substantial increase in bio-fuel production for transport use is set to increase in light of the current oil price hikes, both in the developed and in the developing world.

(vii) While a biomass industry base and a readily available biomass feedstock are strong factors behind the relatively more developed bioelectricity sector in some countries, usually the development of bioelectricity has also been a result of regulations favouring the input of bioelectricity into the electricity grid and policies supporting the price of bioelectricity, or due to taxes on the use of conventional fuels on environmental grounds.

6. Therefore, a significant increase in bioelectricity use will require strong policy commitment and needs to be accompanied by regulations and guidelines that ensure its environmental sustainability.

BIO-ENERGY COSTS IN COMPARISON TO OTHER RENEWABLES

7. The cost of biomass fuel supply depends on the cost of producing or recovering the biomass feedstock and on the costs incurred during its transport and pre-processing prior to use in electricity generating plants. Biomass feedstock costs vary widely from negative values, in the case of some residues requiring disposal, to relatively high costs in the case of some dedicated energy crops.

8. The final cost of bioelectricity depends on; the supply economics of biomass feedstock, the power generation technology, the scale of operation and the extent to which retrofitting is possible in the case of co-firing or parallel-firing with fossil fuel (eg coal). Combined heat and power (CHP or cogeneration) results in a more efficient use of biomass and could contribute significantly to the economic viability of electricity from biomass.

9. Current bioelectricity costs from dedicated combustion plants range between €60 and €120/MWh depending on the type of combustion technology used and fuel cost. However, much lower costs could be achieved in co-firing applications, where suitable quantities of biomass can be supplied to existing coal plants.

10. The largest potential for cost reduction lies with gasification technologies, in part because of the efficiency gains over combustion plants. Future bioelectricity cost from dedicated plants fuelled with energy crops are likely to be about €50–60/MWh.

11. Biomass energy schemes are estimated to generate between 400 and 800 full time equivalent jobs per GW of capacity installed. However, the greatest value of bioelectricity schemes with regard to employment lies in the fact that quality jobs could be generated where there is great need for them, in particular in rural areas.

POSSIBLE MEASURES AND ACTIONS NEEDED TO SUPPORT AN INCREASE IN BIO-ENERGY DEMAND

(i) Stimulating bio-energy requires a cross-departmental approach at government level.

(ii) Governments have a key role to play in stimulating bio-energy demand through a package of measures including preferential tariffs or quotas for biomass power, capital grants, public procurement, demonstration projects, building regulations and planning regulations.

(iii) Whilst calling for an increased use of bioenergy, the EU must also endorse the mandatory eco-certification of all bio-fuels in Europe and potentially heat and power, whether they originate from domestic or imported sources. Thus, WWF believes it is imperative that the EU establishes a legally binding eco-certification scheme for both domestic and imported fuels, as this will help to protect the environment.

(iv) The eco-certification must also cover the climate benefits of any potential bio-fuel, as energy intensive production methods may mean some bio-fuels offer any advantage over conventional fuels in terms of overall CO_2 emissions reduction.

(v) Bio-energy can be developed without conflicting or indeed competing with agriculture and forest (timber, fibre, non-timber forest products) production or nature conservation needs. National and regional governments should establish energy strategies that include local and regional planning guidelines to stimulate the development of biomass generation.

(vi) The raw material sources will need to be determined at a regional/landscape/catchment level. These will include existing forest resources, dedicated forests, short rotation coppice, dedicated agricultural crops, and residues from existing forest and agricultural operations.

ENVIRONMENTAL IMPACTS

12. The impact of increased biomass production on water consumption and on freshwater biodiversity depends on several factors:

(i) Crop type: whether it's biomass waste or a specific energy crop.

(ii) Land area: whether the crop is replacing an agricultural crop or requiring new land and new water resources.

(iii) Water availability and growth methods.

(iv) River basin linkage: are there upstream or downstream impacts from the crops on freshwater eco-regions and biodiversity?

13. Already millions of hectares of tropical forest have been cleared to make way for the plantations of palm oil, soy and sugar—all major sources for bio-fuels—leading to huge biodiversity losses. As well as polluting soils and waters, the use of pesticides on the crops also threatens biodiversity.

14. In considering the environmental impacts of a bio-energy scheme WWF believes that:

(i) Site specific best methods of production need to be further developed for all raw material sources, backed up by methodologies ensuring effective implementation and monitoring.

(ii) There should be no conversion of natural forest or High Conservation Value (HCV) habitats for energy production. HCVs should be maintained or enhanced.

(iii) Production of biomass fuels should not result in net negative impacts on habitats and/or biodiversity, for example over-use of freshwater may need to be monitored and safeguarded against.

15. WWF believes a number of key principles are required to ensure that biomass is produced and used effectively for sustainable electricity production, as summarised below:

(i) Life Cycle Analysis principles should be applied to bio-electricity chains to ensure that any significant impacts are dealt with and benefits are captured.

(ii) Bio-electricity schemes need to be subject to rigorous Environmental Impact Assessments (EIAs) prior to implementation to address local potential negative impacts and capture value of benefits.

(iii) Good agricultural/forestry practices must be followed which have been developed to suit local conditions.

(iv) The continuous development and introduction of new varieties and clones that are suited to local soils and climate is necessary to optimise productivity and minimise inputs.

(v) Biomass production practices must protect and/or enhance soil organic matter.

(vi) The level of freshwater use should be assessed throughout the production and conversion chain with particular emphasis on impacts on watersheds.

(vii) Best available conversion technologies (BATs) should be used to minimise emission to air and to other environmental media. Combined heat and power (CHP) systems are preferred.

(viii) Ash quality from conversion processes should be monitored and efforts made to recycle ashes back to land.

BIO-ENERGY—WWF IS COMMITTED TO:

(i) Promoting bio-energy as a viable alternative, carbon neutral, renewable and environmentally sound source of energy to consumers.

(ii) Working with the biomass industry and the progressive parts of the power sector to promote biomass as a replacement for unsustainable, dirty energy production and use.

(iii) Working with agriculture and forestry sectors to promote sustainable supplies of biomass.

(iv) Calling on the national governments, and intergovernmental organisations and other NGOs to develop biomass strategies and incentives to stimulate biomass supply in power generation.

(v) Developing good practice guidelines for bio-energy raw material supplies.

(vi) Advocating the development of best practice standards for integrated pollution prevention and control for power generation plants.

WWF

February 2006

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Memorandum submitted by Inetec (Bio 34)

INDUSTRIAL FOOD WASTE TO RENEWABLE ENERGY

A BACKGROUND TO THE COMPANY AND OUR CURRENT PROJECT PIPELINE WITH A COMMENTARY AND ON PLANNING AND REGULATORY BARRIERS

1. Company Background and Current Project Pipeline

Inetec has in the last five years, developed a unique technology solution for the processing of packaged food waste originating from industrial scale food producers, mass caterers and mass retail. The technology offers very distinct advantages over alternatives and this is now proven by early reference contracts with two blue chip UK companies; specifically Greencore plc and Greggs plc. The company is actively closing contracts with Northern Foods and Tulip and is actively securing other waste feed through a regional network of waste contractors.

The technology (see www.inetec.co.uk) is described as abrasive drying. Water contained within food (both outside in sauces etc and inside within animal and vegetable cells) is removed to a very low level. The technology is physical rather than biological in nature. This allows processing of widely varying waste and large batch to batch differences without problems. In developing the technology literally 1000's of test runs have processed feed wastes as different as supermarket waste, chicks, cow stomachs, stage offal, fish, airline waste, bakery waste, raw pastry, oil laden sludge, DAF sludge from effluent plants and many others.

The technology has been developed via two commercial operations, the first at a Greggs' bakery where it has processed bakery waste and shop return and the second on a pedigree chicken hatchery where it processes rejected eggs and dead chicks.

Inetec continues today with two quite separate sales propositions. The first sees an on-site solution to a client's waste problem on the client's site. Here Inetec aim to process waste to a powdered bio-fuel and then use relatively low cost conventional combustion equipment to convert the waste to steam (or other) energy which is returned to the client. An example of a project in build is for Ethnic Cuisine who produce Chinese ready meals for Marks & Spencer.

The alternative which is proving particularly successful is to take food waste without segregation to Inetec's own processing plant. The ability to accept waste without segregation and with its packing materials is essentially Inetec's unique selling feature. This has lead to three important enabling contracts with Greencore, Greggs and shortly Northern Foods.

In response to established sales and continuing marketing, Inetec's plans now extend to the construction of a national network of 10 plants throughout the UK. The dimension of this business is as follows:

Total no of plants	10
First plant	Immingham (NE Lincs)
Next five plants	Manchester, London, Bristol/SE Wales, Derby, Northampton
Capacity	200 tonnes/d food waste including packing 200 tonnes/d food contaminated packing
Total capacity	10 x 400 = 4000 tonnes/d 1.4 million tonnes/yr

These large operating plants seek to use the biomass prepared in the Inetec process and convert this to synthetic gas and then to largely (usually more than 90%) renewable electricity. Once again the scale of the planned projects is described as follows:

Each plant	21 MW electricity generated from biomass 5 MW additional electricity generated from thermal energy by-product
Total generation:	260 MW
Renewable generation:	234 MW
Total investment:	£300 million
The status of the project is as follows:	
First plant:	Initial waste capacity now sold Project funding secured subject to planning Planning to be submitted September 2006 IPPC permits to be submitted August 2006 Start of construction February 2007 Start of operations December 2007
Next four plants:	Submission of planning 2006 Start of construction—phased 2007 to 2008 Start of operations—2007 to 2008
Completion:	10 plants operating approximately 2008 to 2009

In order to exploit the market opportunity and bring together the Inetec technology with energy conversion technologies, a special purpose vehicle, EnCycle has been formed.

In order to develop this project in the private rather than public sector the team has had to overcome a number of difficulties:

> As a result of the commercial dynamics of the food production sector, clients have been unwilling to contract for prolonged periods as is the case for municipal waste. In response Inetec/EnCycle has had to develop innovative forms of contract with these clients which we view as part of our intellectual property.
>
> In similar fashion Inetec/EnCycle have had to rise to the challenge of guaranteeing projects against relatively weak balance sheets. Again the team has had to rise to this challenge by a combination of methods including innovative use of project insurances.

In short Inetec/Encycle are on the verge of submitting planning (September 2006) and starting the first build in February 2007.

2. Planning and Regulatory Barriers

In developing the business literally from a new start Inetec have had a variety of positive and less positive experiences driven in differing ways by Government.

EQUITY—Firstly it is important to state that Inetec has received sustained investment support from Finance Wales, the investment arm of the Welsh Assembly Government who own approximately 1/3rd of the Inetec business today.

GRANTS—Secondly, Inetec trades in an Objective 1 area and has received or won a number of important grants to support research and development, business infrastructure and product demonstration. Not least are 2 SMART awards.

LEGISLATION: LACK OF STABILITY AND U TURNS—A key element of many innovative business plans is Environmental legislation. This forms an early cornerstone supporting investor confidence. Often the legislation demands innovation in itself or drives innovation by causing a price escalation in a market.

In Inetec's case it was working on the pending implementation of the EU Animal By-Products Regulation 1774/2002 and at that time had raised some £3 million against the Inetec technology and its plans to exploit a legislation driven market place.

Under market pressure, government in the UK felt it impossible to meet the original deadlines of this European regulation and sought and obtained a derogation to the end of December 2005, thus allowing 12 or more months extended time for compliance.

This action in itself lent weight to the fact that the legislation would be implemented by the revised date, albeit 12 or more months late.

Under various further pressures from a number of European governments, the regulation so far as it applied to our sector, was subsequently withdrawn entirely as a legal requirement leaving the Inetec technology, its pricing, its submitted contracts and its investors all in turmoil.

Suffice it to say that it took some 12 months to recover Inetec's prospective clients, to submit new commercial offers which essentially had to compete with landfill, and to substantially regain a market position. Amongst many losses in this period was an entire round of equity investment.

The response of UK government and of DEFRA was simply that the next piece of legislation (the Landfill directive) would "catch" the waste practice, and this would in some way recover the situation. The reality of this is that the landfill regulations require waste to be pre-treated prior to disposal and that such requirement will be phased in, presumably from Oct 2007. There remains no clarity of either the true timescale for implementation or indeed what would and what would not constitute pre-treatment. Suffice it to say that there is widely varying opinion from DEFRA who state it would "need to be meaningful", through to industry associations who say it is likely to be trivial.

It should be relatively easy to appreciate that the U turn on the original legislation followed by more than 12 months without subsequent clarification seriously damages the position technical innovation companies such as Inetec.

Legislation is a great economic driver underpinning investment and innovation; however when it fails in this way, the net effect is precisely the opposite, essentially restricting innovation, causing businesses to fail and damaging investor confidence.

3. Planning and Permitting—Today's Barriers

Having moved to a position of commercial based competition essentially against truck and dump landfill, Inetec is now faced with a plethora of legislation.

Inetec's problem is not so much the legislation itself, but the timescale and cost of meeting necessary approvals. The following arguments are put forward for consideration in that they portray the problem and state or imply a possible solution:

General—projects such as Inetec/EnCycle's make a contribution to key government targets including reduction of landfill, climate change and renewable energy. However movement toward change is now more hindered by "standard" regulation and procedure rather than any incentive to change. There is surely room to suggest that these very serious targets demand a more innovative approach from government and in key places a new resource. The key areas can be expanded upon:

Planning—response to request for scoping—prior to any planning application being duly made, it is common practice to seek from the planning authority an opinion concerning the issues in planning which the developer need to address. It is Inetec/Encycle's experience that the speed of response at this stage is so slow that that it is virtually akin to the speed of the planning process itself. It seems that whilst due process is followed, the planning officials excuse themselves whilst waiting on statutory consultees (English Nature by way of an example) and the consultees seem to be under little if any obligation at all. The perception is that development is bad and needs to be restricted and controlled. The reality is that global warming and renewable energy needs far more urgent attention with all organisations playing their part in a far more workmanlike way.

The same principles apply throughout and can include the planning permission itself, the PPC license and the grid connection all of which run into remarkably long timescales. Eg PPC seven to eight months and grid connection 12 months.

Additionally the interplay of the various agencies causes increased delays in obtaining some of the incentives offered. For example, the interplay of DEFRA and the Treasury with regards to administering ECAs appears to extend the timescales for granting such benefits and also enforcement and interpretation of the regulations is often punitive. Similar issues are evident when looking at the qualification process for ROCs.

Repeated Application From A Zero Base—A further feature of the planning and licensing process is that each project seems to Inetec to start from a zero basis as if no similar project had ever been implemented and each plant seems to be considered as if no plant had ever been built before. By way of example the scoping position of a planning authority could easily be established before a developer ever proposes a project. This would allow an immediate opinion on traffic, air pollution, nature, visual impact, building levels, flooding etc to be given.

Equally the licences seem to be considered individually rather than generically and each officer begins that consideration from largely the same starting point.

If for instance the UK is seriously going to adopt a renewable energy based industry, then it must be resolved how the impetus of this industry can be released, albeit with proper planning and management etc. rather than the current stranglehold of regulation, planning and process.

Inetec wishes to stress that this document is not intended as criticism of any individual. Inetec does however believe that change is needed in current processes and that Inetec and similar organisations can only dramatically impact upon quite serious government targets if such change is enabled.

Inetec awaits with great interest, the recommendation of the Select Committee and above all else, the implementation of changes which will allow swift and appropriate processing of licence and planning applications.

Inetec

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