Biomass Task Force

Report To Government • October 2005

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FOREWORD by Sir Ben Gill

The challenge set for the Task Force was to make proposals to optimise the contribution of biomass to a range of targets and policies set by the Government.

In setting out the case for biomass we noted that the Energy White Paper contained clear aspirations about renewable energy, security of supply, competitiveness and fuel poverty. The Government also has the important objectives of sustainable development and sustainable farming, forestry and woodland management. Taken together, all of these aims can deliver environmental improvement and also economic benefit particularly in rural and other areas.

Our work has shown that the potential of biomass is significant. We have taken the real contribution it can make to the climate change agenda as the primary driver. In putting in place a programme of actions to deliver biomass energy there is a critical need for a strategic approach by the Government to enable the potential to be exploited.

We focus on the fact that in spite of more than one-third of primary energy being used for heat there has been a lack of recognition of the role of renewable heat in policy delivery. The approach could be characterised as - no targets; no concerted policy; no strategy; and, limited support for development. So far as DTI's Energy White Paper is concerned there was a missed opportunity to develop targets for renewable heat and this has perpetuated an inconsistency of approach in Government and in the Regions.

We are consequently in the position that biomass is far from being fully deployed in the UK and a considerable biomass feedstock resource is not being utilised. There is also a significant degree of ignorance about biomass which needs to be addressed, including a perception of high risk which is often not justified. Waste-derived biomass is an important resource which could be utilised within a comprehensive waste strategy.

Biomass is unique as the only widespread source of high-grade renewable heat and this inevitably becomes the key pillar of our report. The challenge to the Government is to recognise that renewable heat can effectively and efficiently save carbon and help deliver the climate change agenda at a cost which compares favourably to many of the other options. If the other benefits biomass can deliver are also recognised the case for support is strengthened further.

In this report we set out a series of recommendations. Together they constitute a strategic approach which we believe should be adopted by the Government and delivered in a consistent way. There are clear linkages between the recommendations and we commend them to the Government to be considered as an integrated package which we believe will lay a foundation on which the biomass sector can develop.

Finally I would like to note my appreciation for the contribution of the other Task Force members, John Roberts and Nick Hartley, and for the support of the Secretariat – David Clayton, Rebecca Cowburn and Nikki MacLeod.

Sir Ben Gill

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EXECUTIVE SUMMARY

Introduction

The object of this report is to shift the barriers which stand in the way of the greater use of the biomass resource and provide solutions which lead to their removal.

The barriers to the greater use of biomass are various:

- Ignorance of the potential of biomass as an energy source
- A heavy emphasis on renewable electricity electricity, with no carbon-reduction value being placed on the development of biomass heating
- Issues associated with the designation of waste and the implementation of the relevant waste regulations
- A fragmented approach within Government, both nationally and regionally
- Challenges associated with securing local planning consents
- The lack of a robust supply chain
- Past market conditions which have undermined the viability of CHP projects
- The lack of an effective single voice for the industry

Yet the potential supply of usable biomass is large.

- Our vision statement suggests that around 1 million hectares of land may be available for non-food uses in general. This could mean, on current yields, around 8 million tonnes of energy crops
- Around 5-6 million tonnes of wood waste is currently generated per annum. Of this around 1.4 million tonnes were recovered in 2004. Studies suggest that an additional 1.5 million tonnes of high quality waste wood and around 2-3 million tonnes of contaminated waste wood could potentially be recovered
- Waste, which has substantial resources, needs to be quantified to include dry and wet waste via Anaerobic Digestion

The potential to use biomass to reduce UK CO_2 emissions is significant. But the use of biomass also contributes to other objectives notably security of energy supply and rural objectives.

Biomass-fired heat

Biomass is unique as the only widespread source of high-grade renewable heat. This characteristic is central to our proposals. Yet this has hardly been acknowledged in policy despite the fact that heat accounts for over a third of primary energy consumption.

Overseas experience demonstrates the large potential to use biomass to fire heat systems and networks in industry, commerce, government building and local housing developments. Moreover with present changes in relative fuel prices, the relative cost of biomass and gas and oil-fired systems is changing. In some circumstances biomass may even now be the best option, though this is rarely recognised by investors.

In recognition of the benefits of biomass heat in reducing CO_2 emissions, at what can be a low cost in relation to alternatives, and as a means of focusing investors throughout the economy on options which they currently ignore, we recommend that the Government urgently introduce a single capital grant scheme to grant aid all biomass heating boilers and the heat element of CHP biomass-fuelled plants. We propose that the grant be fixed at 40% of capital expenditure of the boiler or CHP equipment, including the associated infrastructure needed, for 5 years and that progress be reviewed after 4 years. This approach would yield rapid increases in activity. An alternative approach by way of a Renewable Heat Obligation has been suggested, to us, but we consider the idea to be unworkable.

The second main plank of our approach to biomass heat is to encourage more investment in the public sector. The Government Estate contains 50,000 buildings. We see considerable possibilities for the public sector to increase the amount of investment both in heat networks and in standalone biomass-fuelled boilers for heating, if necessary by a programme of positive preference.

We recommend that surveys of the heat requirements of government buildings should be commissioned and programmes for the conversion of these systems to biomass be executed. Each Department, RDA, GO and local authority should publish ambitious carbon targets for 2010 and 2020 for the use of renewable heat, electricity and CHP in its buildings, with the direct use of renewable energy being preferred to the indirect use of renewable energy by way of contracts with electricity suppliers. Targets should include schools, hospitals and other buildings in public ownership.

In drawing up our proposals for biomass-fired heat our object has been to achieve rapid progress. Renewables currently account for 1% of the heat market. With the package of support measures and actions set out in this report, we believe that it should be possible to increase the renewables share of the heat market to 3% and 7% by 2010 and 2015. To ensure progress Ministers should detail the percentage of energy supply the Government expects will be developed from biomass by 2010 and 2020, while establishing the proportion that should come from the public and from the private sectors.

We detail a number of regulatory barriers to the development of biomass energy which the Government could remove at no or low cost. Obvious examples being revised Building Regulations and an approvals system which removes the need for individual testing of boilers.

Biomass waste

The second major theme in our report is the importance of the better use of waste. We fully support the development of waste policy within the framework of the waste hierarchy, but believe that within this hierarchy the sensible use of waste to produce energy is not being optimised. The figures for the amount of wood waste going to landfill demonstrate that this is so.

We recommend that the Government provides a clear steer that waste is an asset and that efficient and safe recovery of energy from waste (post re-use and recycling) should be actively encouraged. As a matter of urgency, the Government should seek to establish an EU procedure where waste products that have been suitably processed can cease to be classified as waste.

The biomass supply chain

The central problem with the production of biomass crops is often characterised as a "chicken and egg problem". Which comes first the supply or the demand? We think it must, in the main, be the demand which pulls through the supply. Nevertheless, there is a co-ordination problem. We address this by recommendations in the following areas:

- a second round of the Bio-energy Infrastructure Scheme;
- the development of producer groups or co-operatives, with initial responsibility being taken by the RDAs to analyse the infrastructure needs in their region and seek to facilitate supply chain development;
- the establishment of quality standards and certification to ensure that feedstocks of appropriate quality to be used within given conversion technologies;
- the use of life cycle analysis to ensure that the carbon impacts of different options are understood;
- the continuation of the Energy Crops Scheme, including planting grants and producer group support;
- the amendment of the Entry Level Scheme to recognise the biodiversity and other environmental benefits of energy crops;
- the need for research into new feedstock options, such as short rotation forestry.

Institutions

We place particular emphasis of our proposals for institutional reform. Our view is that policy lacks clarity, since Government departments have different agendas. The role and potential of biomass has not been well understood and there has been an over-emphasis on renewable electricity. Out-dated regulations have remained in place.

To provide a sound foundation on which to build a biomass sector the Secretaries of State for Trade and Industry and Environment, Food and Rural Affairs acting jointly should take overall responsibility for the Government's commitment to act on the recommendations of the Biomass Task Force, and should appoint Ministers in their Departments to lead jointly the detailed implementation. An important key is an implementation plan to take forward Task Force recommendations which should be delivered to Government through the Sustainable Energy Policy Network and published.

Yet for national policy to be successful it is essential to have focused regional delivery. To help the development of biomass energy Regional Development Agencies should set targets for delivery of carbon savings in their region, for which biomass will form an important part.

We also see important roles for the Carbon Trust and the Energy Saving Trust as the national leads for advice and information.

We make two recommendations with a direct cost to the Exchequer. Our proposals for grant support to develop biomass heating will cost £10-20 m a year. On supply chain development we have proposed a further round of the Bio-energy Infrastructure Scheme with funding of £3.5m.

It is essential that the recommendations in the report are considered and implemented as a whole if we are to exploit, with the needed urgency, the potential that biomass presents for the mitigation of the climate change.

Section 1
Background

CHAPTER 1 - CONTEXT

1.1. In the 2003 Energy White Paper[1] the Government set out four goals for energy policy:

- to put the UK on a path to cut carbon dioxide emissions by 60% by about 2050, with real progress by 2020;
- to maintain the reliability of energy supplies;
- to promote competitive markets in the UK and beyond, helping to raise the rate of sustainable economic growth and to improve productivity; and
- to ensure that every home is adequately and affordably heated.

Targets

1.2. At the time the Energy White Paper was published the aim was that renewables should supply 10.4% of UK electricity by about 2010, subject to the cost to the customer being acceptable. The aspiration was to double renewables' share of electricity by 2020. The level of the Renewables Obligation was subsequently increased so that it is to reach 15.4% by 2015-2016. This addressed concerns about the likely fall in the value of Renewable Obligation Certificates. Even so, there are concerns about whether the 2010 target will be reached.

1.3. The UK has a Kyoto Protocol commitment to reduce greenhouse gas emissions by 12.5% below 1990 levels by 2008-2012 and there is a national goal to move towards a 20% reduction in carbon dioxide emissions below 1990 levels by 2010. Beyond that, the Government has accepted the Royal Commission on Environmental Pollution recommendation to put the UK on a path to reduce carbon dioxide emissions by 60% by about 2050. Recent figures suggest we are likely to fall short of the national goal.

Biomass struggling to make progress

1.4. The burning of biomass, excluding energy from waste, currently makes a small contribution to the UK's energy balance: about 1.5% of electricity[2] and about 1% of heat is produced in this way[3].

1.5. So far as electricity is concerned the Renewables Obligation (RO) is the principal mechanism of support. The sources of renewable electricity are diverse and the RO seeks

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[1] Energy White Paper: Our energy future – creating a low carbon economy, DTI, February 2003, CM 5761

[2] Includes co-firing, municipal solid waste combustion, sewage sludge digestion.

[3] Renewable Heat and Heat from Combined Heat and Power Plants – Study and Analysis, *Future Energy Solutions (FES) from AEA Technology*, August 2005

to develop them without favouring any particular technology. Within that context biomass has struggled to make progress, indeed the level of activity is in significant part the result of earlier support by way of the Non-Fossil Fuel Obligation (NFFO). Ofgem's second annual report on the Renewables Obligation[4] shows that there were 11 accredited biomass generating stations in England in 2003/04 and 2 in Scotland. 28 accredited generating stations co-fired biomass, 27 in England and one in Scotland. Installed generating capacity totalled 158MW for biomass stations and 516MW for co-fired stations. Figures show[5] that by 2003-04 ROC-supported biomass, including co-firing, accounted for 0.5% of national electricity supply. This was predicted to rise to around 0.9% by 2010-11.

1.6. Of the current projects funded by the Bio-energy Capital Grant Scheme, most progress is being made with the development of biomass heat applications. Of the seven larger electricity or combined heat and power projects significant progress has been made by two with the remainder encountering challenging barriers. The 2005 report by the NAO[6] noted that there is a risk that many of the projects will not go ahead.

Appointment of the Task Force

1.7. It was against this background that the Biomass Task Force was launched on 15 October 2004 to assist the Government and the biomass industry in optimising the contribution of biomass energy to renewable energy targets and to sustainable farming and forestry and rural objectives. Our work for this one year study has been led by Sir Ben Gill, working with John Roberts from United Utilities and Nick Hartley from Oxera Consulting. The terms of reference for the study are set out in Appendix A. They exclude consideration of liquid biofuels and the EU indicative targets of 2% and 5.75% at 2005 and 2010 respectively, except where there is an impact on, and likely competition for, biomass feedstocks.

1.8. Initial questions were posted on the Task Force web page, http://www.defra.gov.uk/farm/acu/energy/biomass-taskforce/index.htm . This began the iterative process which continued with the two progress commentaries, the interim report and the emerging conclusions and draft recommendations report.

1.9. In undertaking this study for Government we have defined biomass in its widest sense – literally, any biological mass derived from plant or animal matter. This includes material from forests, crop-derived biomass including timber crops, short rotation forestry, straw, chicken litter and waste material. Planning and Policy Statement 22 defines biomass as "the biodegradable fraction of products, wastes and residues from agricultural (including plant and animal substances), forestry and related industries, as well as the biodegradable fraction of industrial and municipal waste".

[4] The Renewables Obligation – Ofgem's second annual report, February 2005, 44/05.

[5] NAO report on renewable energy 2005

[6] NAO report on renewable energy 2005

1.10. This assessment of biomass for energy looks at the potential development of biomass energy against a vision of where the key determinants of policy are likely to be in 2020 and beyond, with particular interest in seeking to reduce the UK's level of CO2 emissions in order to mitigate climate change. The study is not about finding a use for redundant farmland but rather concerns the strategic development of a viable biomass sector which, at the same time, delivers sustainable development for both the rural and forestry sectors. This is consistent with the Sustainable Farming and Food Strategy and potentially takes advantage of the decoupling of support under reform of the Common Agriculture Policy.

Engagement with stakeholders

1.11. Our work has greatly benefited from dialogue and consistent engagement with and by stakeholders. We have been in touch with trade bodies, individual companies, government departments, regional representatives such as Regional Development Agencies (RDAs) and Government Offices (GOs), industry and other stakeholders. A large number of meetings and visits have been undertaken and we would like to record our thanks to stakeholders for their commitment and input to this study since October 2004. Details of the visits and meetings are in Appendix H.

1.12. The submission of written responses to our various reports has been of great assistance to our work. A list of those who responded to our report is at Appendix I.

Barriers to investment in bio-energy

1.13. We have been asked to consider the optimal contribution that biomass can make to economic, environmental and social objectives. There is a strong expectation that our report will do something to shift the barriers which currently seem to stand in the way of the greater use of the biomass resource, including both virgin biomass and "waste" biomass resources. A large number of barriers have been identified to us and we set out the full list at Appendix C. These barriers are of at least five kinds:

- unnecessary or disproportionate bureaucratic restrictions;
- the risks which are inherent in any new market but which can be removed over time;
- economic constraints;
- market failures; and,
- ignorance of biomass and its potential.

1.14. A firm basis for intervention by Government will always be the presence of external costs and benefits, which mean that decisions made by market participants fail to reflect the full cost of their activities. In the case of biomass, the most obvious externality surrounds the need to reflect the social cost of carbon dioxide emissions in private decision-making. But there are others, particularly the social costs and benefits associated with different ways of organising the rural economy and possibilities for using biomass to increase the security of energy supply.

1.15. Looking at our report as a whole:

- significant parts deal with the possibilities for removing unnecessary impediments to investment in biomass: in many cases these impediments can be removed without cost, and we would expect to see our recommendations followed up quickly;
- other parts deal with ways to generate greater confidence and greater co-operation between the different parts of an inevitably fragmented chain of supply: again these actions are, in general, not likely to be costly;
- the most difficult set of issues surrounds the ways in which policy can be adjusted to have full regard to the wider benefits of reducing carbon dioxide emissions - policy here must be pursued in relation to alternative ways of saving carbon.

Geographic coverage

1.16. We note that while this report was commissioned with an England focus we have sought to engage with the devolved administrations and to understand their perspectives on biomass energy. We are grateful for the input we have had from colleagues in the devolved administrations. Many of the principles which this report sets out have relevance in all of the geographic areas of the UK and we suggest that the Government considers with the devolved administrations how they should be applied throughout the UK.

Vision for Biomass

The set of working assumptions used in our vision for biomass over the period to 2020 and which have helped us frame our recommendations are:

- Climate change impacts and the need to reduce carbon emissions are a key driver for developing biomass energy.
- Energy demand will increase and the UK will need to deploy a wide range of technologies to meet its future energy needs.
- The unit cost of renewables will fall as they are deployed and, by 2020, the EU Emissions Trading Scheme will be one of the main means by which low carbon generation is encouraged.
- By 2020, the EU Emissions Trading Scheme will be one of the main means by which low carbon generation is encouraged.
- Biomass will provide a growing proportion of UK energy needs, especially in heat and in rural and semi-rural locations.
- Waste will be seen as a secure and sustainable source of biomass energy.
- We have assumed that around 1 million hectares of land may be available for non-food uses in general.
- There is an expectation that energy crops, particularly short rotation coppice and miscanthus, will continue to show yield increases as new varieties are developed and commercialised.
- Energy price rises have, and will continue to, improve the environment for investment in biomass energy.
- In the case of heat the capital cost of equipment is higher for biomass and the perceived risk is greater than for fossil-fuelled generation.
- Plant products will increasingly be used in “Chains of Utility” which secure multiple use of the resource including, ultimately, energy use.

Our recommendations are to a large extent predicated on the FES study “Renewable Heat and Heat from Combined Heat and Power Plants”. Biomass-fired electricity will continue to qualify for the Renewables Obligation and so will be able to draw on a significant degree of support. Biomass-fired heat receives much less assistance, but seems, in some circumstances, already to be a good proposition in economic terms particularly on a revenue basis, and even more so at current oil and gas prices.

The development of liquid biofuels is likely to lead to competition for feedstocks and, consequently, for land. We have not proceeded on the basis that current oil prices will be maintained at today’s levels of around $60 per barrel. Financiers would take the same position. Nevertheless, we are working on the assumption that the underlying price of oil has seen a significant upward shift which will persist.

CHAPTER 2
THE POTENTIAL OF BIOMASS

2.1. Biomass has the potential to be produced from a number of sources including virgin material such as crops and forestry, recycled clean biomass and waste from municipal and commercial sources, sewage, and food and animal wastes. Action to support the development of biomass has, to date and in the absence of targets for renewable heat, focused on the generation of electricity. Appendix B sets out the detail of grant schemes and other support directed towards biomass. The appendix shows a complex picture of somewhat fragmented support. This brings with it the risk that grant and other support is not used effectively to facilitate development.

2.2. Biomass is unique amongst renewable energy sources for three reasons:

- The production of energy from biomass, with the exception of anaerobic digestion, involves the production of useable volumes of heat. This production of heat alone can give energy extraction efficiencies of 80% or more and is not limited to particular parts of the country, unlike geothermal systems.
- Biomass feedstocks, with the exception of waste biomass which may have a value, have a cost associated with them. This has a significant impact on project viability, especially for electricity generation, and implications for the level of support needed for market development.
- Biomass, unlike other renewables, has the potential for continuous generation of electricity.

2.3. Biomass also has its limitations. Unlike gas, though like oil, it has to be stored by the user. Further, given its bulky nature road transportation of biomass is expensive relative to the value of the product. Ideally feedstocks will be sourced close to end uses. Road transportation adds economic and environmental impacts and affects carbon and energy balances.

2.4. A substantial amount of the biomass resource appears as waste, yet, as one stakeholder commented to us “waste is the most wasted resource”. Policies and strategies have emphasised recycling and reuse, but there has been a failure to recognise waste as a resource which has the potential to be used for energy, thereby making a significant contribution to the biomass supply chain. Energy recovery must increasingly be recognised as one element within the broad waste management strategy. We cover this in more detail in paragraphs 4.20 – 4.29.

2.5. Energy prices impact directly on the development of renewables. Since the Task Force began its work in October 2004 UK electricity prices have been rising. Official figures show that domestic gas and electricity prices rose by 10.5% and 7.5% respectively in the second quarter of 2005 (on a year earlier); while industrial gas and electricity prices rose by

36.4% and 28.7% over the same period. Prices seem likely to remain high: we understand that one-year forward prices are now one-third higher than a year before, and over twice as large as in 2003. These rises in prices will help the future competitiveness of renewables projects, even so over the period 1994-2004, the real price of gas and electricity to domestic consumers declined by 11% and 27% respectively, whereas industrial gas prices fell by 7% and electricity prices by 35% in real terms. Despite the benefits to the consumer, this had an adverse effect on the development of biomass CHP in particular

Feedstock potential

2.6. While published estimates of feedstock volumes can vary greatly depending on assumptions made, what is clear is that significant amounts of biomass materials are available within the UK. The total, from the data we have assembled, shows 20 million tonnes of material which could be used for energy. Wastes – both municipal solid wastes (MSW) and animal wastes - offer the greatest immediate sources of energy, with 2.5 million tonnes of MSW already being used for energy generation and a 400% increase in available tonnage anticipated by 2010. However, the development of Refuse Derived Fuel (RDF) from MSW, although offering improved handling characteristics, higher calorific values and a more consistent burn than MSW, has had restricted market penetration to-date due to the need to burn it in Waste Incineration Directive-compliant plants. Also, there could be a significant contribution from forestry, wood waste and crops with what we consider to be conservative estimates totalling nearly 5 million tonnes.

2.7. Around 3 million tonnes of wet animal slurries and manures are generated annually in the UK; if 50% of these farm wastes were processed in anaerobic digesters, they would potentially contribute up to 1.1 TWh per annum of electricity, resulting in carbon savings of over 0.13 MtC per year. Co-firing has raised the profile of both forestry and energy crops as sources of biomass and, although much of the co-firing capacity currently uses imported materials, the hectarage of energy crops is increasing annually, with current combined plantings for short rotation coppice and miscanthus of around 2,500 hectares (equivalent to yields of around 25,000 tonnes per annum).

2.8. Our vision statement assumes that around 1 million hectares of land may be available for non-food uses in general. This could mean around 8 million tonnes of energy crop. The development of biofuels in the UK is likely to lead to competition for feedstocks although some biofuels, or their feedstocks, will be imported.

2.9. The use of biomass generally focuses on the potential to deliver heat or electricity yet biomass also has the potential to deliver absorption cooling from the heat produced by CHP or from a district heating network. In these circumstances water is used as the refrigerant. An absorption chiller has the effect of increasing the base heat load all year round, leading to increased energy savings. Woking Borough Council has the first small-scale CHP/heat-fired absorption chiller system in the UK which provides heating, hot water services, air conditioning and electricity to the Civic Offices.

2.10. Plants are complex and the uses to which their products can be put are wide-ranging. Bio-refineries are likely to exploit the potential of plants in new ways, through the extraction of raw materials for use by industry with use of the by-products as an energy source. Pressure to secure maximum value from supply chains will ensure plant products have multiple uses before energy recovery takes place.

Realising the potential
Woking Council Private Wire System

Background: Woking Borough Council is a Beacon Council for sustainable energy. Energy efficiency is a priority and has been for many years

Issue: Much work had previously successfully been undertaken by Woking Borough Council to reduce energy consumption within council housing stock – a 30% reduction over 10 years - and there was limited scope for further savings. However, Woking BC identified an opportunity for further efficiencies in the production and distribution of electricity.

Approach: The Council established a number of high and low voltage private wire networks in and around the centre of Woking, linked to CHP (combined heat and power) plant and a community heating and cooling distribution system of water pipes. The aim was to reduce electrical distribution losses (which are reported to average 6 – 10% on a national grid-based system) by using local private wires. In addition, small, local networks can avoid a range of charges associated with connection to, and use of, the local distribution network, including being exempt from the requirement to have a licence for generation, supply and distribution (subject to certain conditions).

Outcome: The resulting cost savings, combined with the higher fuel conversion efficiency of CHP, the netting off of surplus electricity production between private wire sites and the sale of heating and cooling services, help to mitigate the additional costs associated with small-scale energy generation. This approach has brought the cost of sustainable 'green' electricity into line with 'brown' electricity prices.

Investment in biomass heat and power

2.11. Biomass use in electricity has been increasing, first under the NFFO and subsequently under the Renewables Obligation. But studies suggest that, with the important exception of co-firing, biomass-fired electricity is at the margin of profitability, even taking current methods of assistance into account, and even with existing combustion technologies as opposed to more-experimental technologies. Within the Renewables Obligation, the burning of landfill gas and the generation by wind-power are currently the favoured technologies. We return to the role of and drivers for biomass-derived electricity in paragraphs 4.13 - 4.19.

2.12. The burning of the biodegradable component of municipal solid waste, combined with sewage sludge digestion, currently provides 0.7% of electricity. Profitability is generally greater than in the case of virgin biomass. Indeed work done by consultants for the Renewables Obligation Review concluded that "the majority of energy from mixed waste projects would become economic anyway as a result of waste sector drivers, such as rising landfill tax and the Landfill Allowances Trading Scheme". Nevertheless, recognising the important role which energy from waste will have in meeting the 10% renewables target, the Government has said that it "will actively explore further options to promote and support the delivery of additional energy generation from the biomass fraction of residual, post-recycling waste as a renewable energy source, as part of the ongoing review of waste strategy"[7]

2.13. Biomass-derived heat has seen a significant decline in recent years, following the decommissioning of some industrial wood systems to meet new emissions requirements (the output of heat from industrial wood boilers fell by nearly 50% between 1996 and 2004)[8]. But the economics of industrial and commercial applications of biomass to derive heat are now improving. While Climate Change Agreements (CCAs) can sometimes assist such projects, more importantly increases in oil and gas prices have started to alter the relative profitability of using renewable fuels. Recent estimates by Future Energy Solutions (FES) suggest that, even assuming the energy price trends used in the last climate change programme review (i.e. fossil fuel prices which are substantially below today's levels), the use of biomass to provide heat in industrial and commercial settings, with continuous demand, already looks to be competitive with oil and gas.[9]

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[7] Renewable Energy: 2005/6 Review of the Renewables Obligation Statutory Consultation Document, DTI, September 2006, paragraph 3.9.

[8] Digest of UK Energy Statistics, 2005, table 7.7.

[9] Renewable Heat and Heat from Combined Heat and Power Plants – Study and Analysis, Future Energy Solutions (FES) from AEA Technology, August 2005. This report suggests that the current costs of creating heat for commercial continuous demand are £21MWh from biomass, £18MWh from gas and £22MWh from oil. Equivalent figures for industrial heat are £17MWh (biomass), £20MWh (oil) and £27MWh (gas).

2.14. Investment in biomass energy does involve risk. One issue is whether firms would in practice conduct their investment appraisals in the way suggested in the illustrative calculations in the FES study in particular whether they would make the same assessment of the risks involved.

2.15. The domestic use of biomass heat boilers is expensive compared to fossil fuel alternatives, though, even here, relative prices are moving in favour of biomass.

2.16. A key concern is that whilst the use of biomass for the production of electricity is already encouraged by way of the Renewables Obligation, incentives for the production of renewable heat are substantially weaker. This lack of recognition of the value of renewable heat has led to a failure to harness the carbon benefits from the replacement of fossil-fired boilers with biomass-fired systems. It has also led to a failure to recognise that heat-only systems can deliver efficiencies far in excess of those designed to produce electricity alone.

2.17. There are a number of other reasons why, despite the apparent competitiveness of biomass-derived heat, investors in industry and commerce are doubtful about a move away from the fossil fuels they currently use.

2.18. A major constraint is, of course, the rate at which the current capital stock is replaced: companies will be most susceptible to new technologies at the point when they come to replace existing equipment. In the case of heat systems a normal life expectancy would be 20 years. Marked changes in fuel prices may induce premature replacement, but in this case investors will need to be confident that today's relative prices are likely to persist. A particular issue is that biomass investments – requiring both boilers and storage and other facilities – are currently more capital intensive than other heat systems.

2.19. Some constraints on companies' ability to invest in biomass-fired fuel are physical and cannot be removed: for example, establishments on limited sites are always likely to find problems with fuel delivery and storage. But many of the perceived risks to investment can be addressed. Investors may, for example have:

- worries about the long-term availability of sufficient supplies of biomass fuel, and even some worries that available fuel supplies will be diverted to electricity uses by the availability of RO support;
- limited confidence in biomass technologies; and,
- limited confidence in the quality of biomass supplies.

2.20. Such problems of perception can be addressed by judicious intervention. Indeed, some are already being addressed by existing schemes (e.g. the Energy Crops Scheme, Bio-energy Capital Grant Scheme, Enhanced Capital Allowances). Others are addressed by the proposals developed in this report. Some barriers can be removed at little or no cost. Others have a resource cost and a number of our proposals have a public expenditure cost. What is being bought for such costs?

The case for intervention

2.21. The primary focus of our report is on the reductions in CO_2 emissions brought about by the substitution of biomass for fossil fuel. Thus we emphasise the cost per tonne of carbon – the measure used in the climate change programme.

2.22. As a guideline for the cost-effectiveness of our policy recommendations we have used the estimates of the social cost of carbon current within Whitehall – i.e. a range of £35/tC to £140/tC, with central value of £70/tC (at 2000 prices). An alternative approach would have been to aim to achieve a level playing field between the Renewables Obligation and assistance to renewable heat by providing a subsidy broadly equal to the value of the RO. Given that one of the objectives of the RO is to secure long-term technical change in the renewables industry, and given the maturity of heat producing renewable technologies, we believe that the former approach is more appropriate. In this case, the central number for the value of carbon saved is £82/tC (at 2004 prices), and we take this as our guidepost for the broad level of support which should be made available to renewable heat.

2.23. Biomass heat and power can also help in the delivery of two other pillars of energy policy: energy security and fuel poverty:

- Energy security tends to be improved by any reductions in demand for imported fossil fuels: here biomass-fired electricity has the particular advantage that, unlike many other renewables, it provides baseload rather than intermittent power.
- Fuel poverty can be helped if biomass-fired district heating systems can provide cheaper supplies of heat than before.

2.24. Policies directed towards the encouragement of the greater use of energy crops, forestry material and forestry waste will also have local and regional benefits, in that employment will be increased and local communities supported. The importance of these benefits will vary, and in this report we make no general claim for these benefits on behalf of biomass.

CHAPTER 3
BIOMASS IN OTHER COUNTRIES

3.1. Our terms of reference required that we look at international comparisons and this aspect of our work is contained in Appendix F. There are a number of international agencies and organisations actively looking at the potential of biomass, including OECD and the European Union.

OECD Biomass and Agriculture Workshop June 2003

This biomass and bioproducts workshop examined economic, environmental and social sustainability and current and future policies and market approaches. It predicted a significant switch from a fossil to a biobased economy.

The identified benefits from biomass were reduced greenhouse gas emissions, energy diversity and security, enhanced environmental benefits and socio-economic opportunities including rural areas.

Key conclusions:

- Policies must work with markets, stimulating demand for bioproducts and developing appropriate feedstocks.
- Policy options and approaches should encourage innovation and deliver benefits such as low greenhouse gas emissions.
- International standards and codes of practice can help maximise environmental benefit.
- mproved cost and benefit assessments are key in the sustainable development context.
- Clear communication between all stakeholders in the chain is a priority.
- Public education, awareness and understanding have yet to develop.

3.2. A report by the EU Renewable Energy Action (REACT) programme shows that successful policies depend on a comprehensive and consistent approach over the medium-term (six to seven years). They can involve substantial financial resources and economic incentives have been a feature of every successful case of market development. Even so, regulations can be an effective and cheap measure.

3.3. The key lessons which emerge from our assessment of international comparisons are:

- A consistent approach to support in Austria led to the installation of over 850MW of biomass heating since 1994.
- The creation of local ownership, both of the installed equipment and the concept, has underpinned the development of district heating in Sweden.
- 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.
- In Finland, a strategic approach, through its Action Plan for Renewables and investment to develop supply chains, quadrupled the use of biomass between 1999 and 2003
- 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.
- Germany has been active in developing anaerobic digestion with over 3,000 plants established.
- 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.

Biomass Action Plan

The Directorate General for Energy and Transport is taking forward the development of an EU Biomass Action Plan. Key proposals included in the consultation were:

- Considering the external costs of fossil fuels – linking carbon to fiscal support.
- Harmonised quality standards.
- Promoting bioheat through a renewable heat directive.
- Information awareness and exchange.
- Amending the Common Agriculture Policy to promote bioenergy.
- Stability and long-term perspectives in support policies and schemes.
- Integration of EU waste and renewable energy policies.
- Define targets for biogas.

UK stakeholders responded positively to the consultation and suggested a number of mechanisms to help progress biomass energy:

- Promotion of bioheat and small-scale CHP through a renewable heat obligation.
- Simplify and harmonise support arrangements and procedures.
- Bio-residues from forestry, agriculture and similar sectors not to be classed as waste.
- Consider external costs of fossil fuels and the advantages of bioenergy/energy saving, CO2 credits and trading.
- Promote energy crops close to end use.
- Raise awareness through public procurement.
- Support bioenergy development through capital grants.
- Establish, support and optimise supply chains.
- Promote biomass co-firing.

Section 2
Recommendations to Government

CHAPTER 4
DELIVERY BIOMASS ENERGY

A. Biomass-fired heat production

4.1. The option for a renewable heat obligation was raised by the Royal Commission on Environmental Pollution[10]. As a counterpart to the obligation in the electricity market it has obvious attractions given that it does not require the use of public money. There is also a proposal for a Renewable Transport Obligation.

4.2. We have spent some time looking at the possibility of recommending the introduction of a renewable heat obligation, though, in the time available to us, we have not been able to carry out the detailed analysis the Government gave a commitment to undertake in the debate on the Energy Act 2004 and in response to the Royal Commission's report .

4.3. The core of the scheme would be renewable heat certificates which would be granted to heat users/producers who could demonstrate that they had substituted renewable heat for fossil-fired heat. The relationship between the provider of the certificate and the company with the obligation would be for negotiation. The company with the obligation might meet the requirements *via* its own energy service company, supplying both fuel and conversion equipment. But most obviously it would do so by buying certificates from other companies. At the extreme, the company with the obligation would make no effort to meet the obligation either directly or indirectly, but would, as with the RO, simply pay the "buy-out" price. The buy-out fund would then be available to those people who had directly provided biomass-fired heat supplies, i.e. it would, in effect, provide an industry levy which would be used by others to finance biomass-related activities.

4.4. This leads us to the conclusion that the fundamental flaw in such a scheme is that, in contrast to the electricity obligation, the obligation would rest with a supplier who had no control over the many, varied and often small users and producers of heat. Furthermore, the complex details of such a scheme would inevitably take a considerable time to draw up and implement. Given the urgent need for action to meet climate change targets, and the need for increased renewable energy use and reduced carbon emissions, this is time that is not available to the industry and society.

4.5. Our conclusion is that in order to see quick progress towards stimulating activity and securing the carbon potential of biomass heating the preferred route is to support the development of domestic, industrial and commercial investment in biomass heating and CHP through streamlined capital grant support. Our contacts with industry have confirmed us in the view that this is the most effective path since it addresses the initial

[10] Biomass as a Renewable Energy Source, Royal Commission on Environmental Pollution, 2004

barrier of the higher capital cost of biomass equipment. Our judgement is that, notwithstanding recent improvements in the economics of investment in biomass-heating, only the introduction of a grant scheme can overcome present uncertainties among investors[11].

The Rural Energy Trust Biomass for Heat

The Rural Energy Trust is a not-for-profit company limited by guarantee, dedicated to the development of modern, automatic wood-heating as a sustainable and renewable energy source. The project was started in 2002 by farmers, foresters and conservationists in the East Midlands to develop the environmental, social and economic opportunities that a viable wood-heating industry offers.

That same year a sister company called Rural Energy Ltd was formed with 14 farmer shareholders to plug the gap between the Trust's advisory/promotional work and action on the ground. The company now undertakes turn-key boiler installation and supply of wood fuels. Rural Energy Ltd owns and operates its own farm-scale pellet mill as well as a tractor-mounted wood chipper suitable for fuel production.

The organisation has installed 25 heating systems in the East Midlands with a combined capacity of 3 Megawatts. Annual fuel use by these systems is over 1000 tonnes.

The key factors in the success of the Rural Energy initiative have been :

- Providing a one-stop shop for provision of advice, grant-aid, design and project management
- Close relationship and affinity with land-based industries
- Having the resources available to seek out, apply for and secure capital funding for clients from disparate and short-lived grant schemes
- Advice is based on practical experience from installation and fuel supply work.

[11] Enhanced capital allowances, which are available in some cases, provide an insufficient incentive to make substantial progress.

4.6. In determining the potential benefits from the installation of biomass heat facilities there are a number of variables that will apply to individual circumstances which have material effect on the costings and derived benefits. These include:

(i) capital costs that, with a current relatively small UK market, seem to vary considerably. We believe that once a broader market has been established these costs will become more transparent and stabilise at figures below those quoted in the FES study;

(ii) utilisation time which can be as low as 12% of the total annual potential or in commercial conditions much closer to the normal 8000 hours standard annual operating time;

(iii) the energy efficiency standards of the building which can reduce the peak load needs considerably and hence reduce the capacity needs of the boiler and lead to higher utilisation rates.

4.7. These factors make it difficult to be precise about the translation of the value of the capital grant into a cost per MWh(th). Nevertheless, in line with EU rules we propose a grant fixed at 40% of capital expenditure of the boiler or CHP equipment, including the associated infrastructure needed, for 5 years and that progress be reviewed after 4 years. A complication is that in the case of biomass CHP, the carbon savings associated with the electricity output are already rewarded through the Renewables Obligation. In order to allow for this, CHP grants should support capital expenditure in proportion to the percentage of power exported as heat.

4.8. We estimate that the annual costs of such a scheme would lie in the range £10–20 million. Seen as a measure to reduce carbon emissions, it would have a comparatively low resource cost per tonne of carbon.

4.9. In the longer term we would hope that incentives for the use of renewable heat can be provided by the EU Emissions Trading Scheme, the Climate Change Levy and Agreements or the Energy Efficiency Commitment. These approaches would build on existing structures rather than create new ones and provide an additional revenue stream for heat. They would link directly to the value of the carbon saved and give an incentive to maximise emission reductions.

4.10. The potential for biomass district heating systems needs to be better understood. Such systems have wide acceptance in other parts of Europe as seen during visits to Finland and Sweden. They have the potential to offer reduced installation costs and easier maintenance coupled with the delivery of carbon dioxide emission reductions. Their potential as a green development opportunity needs to be highlighted with planners and developers.

4.11. As has already been noted (paragraph 2.9), the potential to deliver absorption cooling from the heat produced by CHP or a district heating network is generally ignored. As an absorption chiller is a heat load it has the effect of increasing the base heat load to heat or CHP units all year round, leading to increased efficiencies.

Trelowarren Estate
Cost-effective and Carbon-free

Cornwall's 600-year-old Trelowarren Estate expects to be carbon-neutral in two years. A biomass boiler will meet all the heat and hot water needs of the estate using wood coppiced from its own forests. Sir Ferrers Vyvyan, whose family have owned Trelowarren since 1427, describes it as "the radical next step" in realising an eco-tourist blueprint which has already won the estate five awards for its renovation of old buildings.

The 300 kW Binder boiler, supplied by Wood Energy Ltd, will use 350 tonnes of coppice produced annually on the Estate and will save 240 tonnes of carbon dioxide each year. It will heat and provide hot water for 38 existing and planned timeshare houses. The heating will also be piped to the leisure centre and swimming pool in the summer, and to the New Yard Restaurant, Cornish Crafts Association's permanent exhibition and the art gallery and workshop in the winter.

The boiler generates its heat for less than half the price of conventional fossil fuel. It costs £45 per tonne to cut and chip the wood for use in the boiler, giving an output figure of 1.2p kW/hr against 2.8p kW/hr for an oil-fired boiler, based on oil prices in early 2005.

Recommendation 1

The Task Force recommends that the Government urgently introduce a single capital grant scheme to grant aid all biomass heating boilers and the heat element of CHP biomass-fuelled plants. We propose that the grant be fixed at 40% of capital expenditure of the boiler or CHP equipment, including the associated infrastructure needed, for 5 years and that progress be reviewed after 4 years. CHP grants should support capital expenditure in proportion to the percentage of power exported as heat.

Recommendation 2

In order to recognise the carbon value of biomass heat the Government should consider and report on potential mechanisms for long-term support including the EU Emissions Trading Scheme, Climate Change Levy and the Energy Efficiency Commitment.

4.12. Renewables currently account for 1% of the heat market. Future Energy Solutions suggest[12] that renewables could add 0.8% and 4.7% to the heat market by 2010 and 2020 respectively. With the package of support measures and actions set out in this report we believe that can be improved on and that it should be possible to increase the renewables share of the heat market to 3% and 7% by 2010 and 2015 respectively. A positive response to the recommendations in this report could see biomass deliver an extra 0.9MtC per annum by 2010, rising to 2.7MtC per annum by 2015. The average resource cost per tonne of carbon would depend on the precise mix of investment, but all the estimates we have seen suggest that it would be low in comparison with the cost of many other climate change policies

B. Biomass-fired electricity generation

SembCorp Utilities UK

A major supplier of essential utilities and services to industry, SembCorp is developing Britain's largest biomass renewable energy project.

This £60m project to build a 30MW power station on Teeside will use wood from a variety of sources. Around 300,000 tonnes of wood will be required annually, of which, 55,000 tonnes will be supplied as short rotation coppice grown by farmers in a 50 mile radius of the site. Sawmill products, small roundwood from forests and recycled wood will supply the balance.

SembCorp is supported with a capital grant of £11.9million from the Bio Energy Capital Grant Scheme.

Compared with fossil generation the biomass plant will save 20,000 tonnes of carbon each year.

4.13. It is not easy to measure the full extent of the support given to electricity generation fired by energy crops, short rotation forestry etc, since expenditure has varied from year to year and schemes have been switched on and off. We do know that the primary means of support, the Renewables Obligation (RO), which subsidises the use of biomass to produce electricity, carries with it an implicit value of carbon that the NAO has estimated[13] as, at

[12] Renewable Heat and Heat from Combined Heat and Power Plants – Study and Analysis, Future Energy Solutions (FES) from AEA Technology, August 2005

[13] Renewable Energy, National Audit Office, February 2005

the minimum, £260/tC saved (assuming the Obligation is met). Renewable projects are also supported by exemption from the climate change levy and have benefited from recent increases in electricity prices. The NAO has estimated that the three policies together produce a minimum cost per tonne of carbon of £290/tC, again assuming that the Obligation is met.

4.14. The figure of £290/tC does not include any allowance for the cost per tonne of carbon implicit in the various subsidies available through Defra and DTI schemes to the various parts of the biomass supply chain, most obviously subsidies to farmers and capital grants to investors in biomass-fired generation capital equipment.

4.15. The RO will, we must assume, continue, implying that policy-makers accept any disparities in cost per tonne of carbon saved. They do so in important part because there is the strong expectation that the subsidisation of renewables today will enable the industry to drive down unit costs as the volume of activity increases. This is particularly important for those technologies where significant technical progress can be expected. One issue is, therefore, the extent to which the technology to burn biomass is not generally expected to exhibit any major technological advances.

4.16. Whatever the prospects for major technological breakthroughs, there are reasons to believe that today's assistance for biomass will pay longer-term dividends. Given the fragmented supply chain, and the current uncertainties which beset investment in any part of that chain, we believe that it is possible to justify policies, like the RO, which serve to provide market participants with greater certainty and so increase the likelihood of creating the critical mass needed to form the base of a successful biomass-fired industry. We deal with the transitional policies towards co-firing which have this aim in particular, in Section E below.

4.17. Assistance to the biomass industry has included a range of specific grants and subsidies, in pursuit of the government aim to deliver a range of renewables. Given the doubts that already surround assistance at the level implied by the RO, how can further assistance be justified? If there was only a carbon objective, it is hard to see that further assistance could be justified, although well directed assistance to that part of the supply chain where the uncertainties and co-ordination problems are the greatest is needed and we have recommended accordingly.

4.18. The relative inefficiency of electricity-only generation, which the RCEP commented on, has to be noted[14]. The RO support, the changes which we propose (recommendation 35), which are reflected in the current Renewables Obligation consultation[15], to enable small generators to benefit from the Obligation more easily and the proposal to place a value on heat, when taken together constitute a package of measures which should facilitate developments, including the production of electricity.

[14] RCEP report, Biomass as a Renewable Energy Source, page 41, paragraph 3.34 and 3.40.

[15] Renewable Energy: 2005/6 Review of the Renewables Obligation Statutory Consultation Document, DTI, September 2006, page 59, paragraph 8.33

4.19. In terms of current carbon savings, biomass-fired electricity does not provide such a good use of any given biomass resource as biomass-fired heat. But energy policy has additional objectives – notably the contribution of energy diversity to security of supply and the need to maintain a wide range of renewable energy options as a means of meeting future carbon reduction policies. These, other Energy White Paper objectives, sustainable farming and forestry and rural objectives could provide a case for further intervention. But we consider this to be a matter for the Government and one which needs to be judged in a context wider than that within which this study has been undertaken.

C. Energy from waste

4.20. Waste is the overlooked resource – it has been viewed as a problem needing disposal rather than as a valuable carbon asset in the fight against climate change. 'Waste' is defined as 'any substance or object which the holder discards or intends or is required to discard.'[16] This definition covers a wide range of different sources (and forms) of material. We have focused on those types of biomass-based waste (or residue) which have the potential to provide a reliable source of energy feedstock. These include the biodegradable fraction of municipal solid waste (MSW), clean waste wood, animal and food wastes, sewage sludge and refuse derived fuel (RDF) from MSW or commercial/industrial waste.

4.21. The potential for energy generation from waste materials in England is significant. At present only around 2.5 million tonnes (c.9%) of the 29 million tonnes of MSW produced annually in England are used for energy recovery; the majority of the remaining waste goes to landfill. On a UK basis, energy recovery from wastes accounts for approximately 0.7% of the UK's annual electricity consumption[17]. Even with increasing recycling rates reducing the quantity of available wastes, it is predicted that by 2010 the amount of waste that will need to be incinerated or recovered will reach 10 million tonnes[18]; current capacity for municipal waste incineration is 2.8 million tonnes per year.

4.22. However, we are not currently making full use of the resources which are readily available. At the present time a significant amount of wood waste is being sent direct to landfill. This could readily amount to 3 million tonnes/year and could generate up to 8.5 TWh of heat, with corresponding carbon savings of 0.85mtC. What is preventing this from happening is the lack of a public body or organisation to co-ordinate the supply of this wood to appropriate energy markets. Such a body would need to work closely with organisations, such as WRAP (Waste & Resources Action Programme), to ensure that wood of recyclable quality was not diverted to energy recovery.

4.23. A number of options exist for converting the waste to energy. These range from well established technologies, such as mass burn steam turbines and heat-only boilers, to research systems, such as plasma arc technology. Other systems are at an intermediate stage - Combined Heat & Power (CHP) and Anaerobic Digestion – where the technology exists

[16] Article 1(a) of EU Waste Framework Directive (Directive 75/442/EEC)

[17] Digest of UK Energy Statistics 2005

[18] http://www.environment-agency.gov.uk/yourenv/eff/resources_waste/213982/203410/?version=1&lang=_e
Article 1(a) of EU Waste Framework Directive (Directive 75/442/EEC) Digest of UK Energy Statistics 2005

and has been shown to work but the costs are higher and associated infrastructure – such as heat distribution networks – may be lacking and expensive to install. Of these plant types, CHP and heat-only boilers demonstrate the greatest conversion efficiencies of waste feedstock into energy (of up to 80% and 90% respectively, compared with 18-35% for electricity production from steam turbines), and consequently deliver the highest carbon savings per unit of feedstock. However, the majority of the 15 energy from waste facilities currently operating in the UK are mass burn steam turbine plants; only three are CHP systems which supply heat to district heating schemes.

4.24. It is clear to us that more of the available waste should be used to generate renewable energy. Decisions on which wastes to use should be guided by the waste hierarchy[19], which prioritises waste reduction, re-use and recycling before energy recovery. It is also clear to us that energy recovery from that waste should be optimised. A number of factors should aid the increased use of biodegradable waste for energy generation. These include the Thematic Strategy on the prevention and recycling of waste, being developed by the European Commission's Directorate General for Environment; this is likely to lead to amendments to the Waste Framework Directive in 2008, with energy recovery being recognised as one element in a broad waste management strategy. Other drivers include the introduction of the landfill tax, the Landfill Allowances Trading Scheme (LATS), the Packaging Waste Regulations 1997 and Government targets for the recycling and recovery of municipal wastes. The proposals in the RO review on the availability of Renewable Obligation Certificates (ROCs) for waste-fuelled CHP plant should also help to encourage the use of CHP, with resulting increased recovery of energy from the waste feedstock and associated carbon savings.

4.25. However, a range of barriers are constraining the development of the sector. Key issues include a reportedly long and complex planning process, a lack of practical, independent, technical advice for local authority planners when assessing new technology applications, negative public perception of "incineration" plants, concerns about a lack of market for the heat component of large-scale CHP/heat-only systems and a reluctance by banks to finance new technology investments following the failure of earlier, first generation projects. Action is needed to address these barriers.

4.26. One approach would be for Government to promote more actively the efficient use of waste for energy, using the experience of the Waste Implementation Programme (WIP) and WRAP on recycling. This could include carrying out awareness raising campaigns and direct liaison with planners, financial institutions, the industry and local communities, to address specific issues. A parallel approach would be the development of a strategic plan for the use of energy from waste, focussing on those types of plant which optimise the off-take use of heat, or heat and electricity, and the associated carbon savings. Technical input should be obtained from the Environment Agency's Waste Technology Data Centre. These approaches would both build confidence and reinforce the message that energy from waste

[19] Article 3(1)(a) of the Waste Framework Directive.

is not simply a waste management option but can offer significant climate change benefits through the production of renewable energy and resulting carbon savings.

4.27. Another reported barrier is the application of European legislation (such as the Waste Incineration Directive (WID) and the Animal By-Products Regulation (ABPR), which impose tighter emissions controls or restrictions on use) to waste products which have a valuable use. Particular examples presented to us include RDF, where the higher emissions standards required by the WID are acting as a block to co-firing with non-waste fuels, and the recent change in the interpretation of waste legislation which has resulted in ash, arising from the incineration of poultry litter and related agricultural biomass, and which was previously used as a fertilizer, being re-classified as a waste product.

4.28. The European Commission is currently seeking to address the underlying principle of when a waste ceases to be classified as a waste (i.e. when it is no longer subject to waste legislation) in the amendments to the Waste Framework Directive, which are to be associated with the Waste Thematic Strategy. While it is likely that the Commission will bring forward proposals that could result in the use of environmental and 'fitness for use' criteria to define when specified waste streams have been fully recovered and have ceased to be waste, it looks increasingly unlikely that such provisions would apply to wastes, such as RDF, whose burning as fuel would be subject to control under the Waste Incineration Directive. They could, however, potentially provide a way forward for poultry litter ash. The application of the Waste Incineration Directive, and related legislation, is important to protect public health and the environment.

4.29. An alternative approach would be to seek exclusion from the scope of the Waste Incineration Directive by getting the product listed under Article 2(2) of the Directive. (A range of wastes are already excluded from the Waste Incineration Directive under Article 2(2), e.g. untreated waste wood.) The UK has recently approached the Commission about an additional exclusion for waste tallow. If sound scientific evidence can be provided, then we understand that the possibility exists of approaching the Commission about the exclusion of other waste streams under Article 2(2) of the Waste Incineration Directive. It appears extremely unlikely that the Commission, and other Member States, would countenance the exclusion of waste products prior to their being burnt as a fuel (e.g. RDF).

Recommendation 3

The Task Force recommends that the Government initiates an awareness raising programme which promotes waste as a valuable asset and which actively encourages the efficient and safe recovery of energy from waste (post re-use and recycling). In parallel with this process, and working with the waste industry, the Government should develop a strategic plan for the use of energy from waste, focused on those plant types which optimise carbon savings and the off-take use of heat and electricity. Appropriate measures, which would actively encourage such developments, should be considered. This should be fully reflected in the Government's Waste Strategy.

Recommendation 4

The Government should set up a strategic group within the Waste Implementation Programme to take forward the development of wood waste as an energy source. This group should include representation from WRAP, given its knowledge of the recycling industry and expertise in industry development.

Recommendation 5

Government should continue to fund, at an appropriate level, the work of the Waste Technology Data Centre, at the Environment Agency. Their ongoing analysis of waste technology performance is key to ensuring that waste incineration plants can reliably meet performance, environmental impact and financial specifications, and so build confidence in the emerging industry.

D. Anaerobic digestion

4.30. Much of the focus of this report, so far, has been on the conversion of dry biomass to energy, via thermal processes. 'Wet' biomass materials, such as pig and cattle slurries, sewage sludge and food wastes, are potentially significant sources of renewable energy. For these, thermal conversion is not an efficient option. The high energy cost of drying the materials prior to thermal conversion or the reduced calorific values of incinerating 'wet' materials directly, would have negative environmental and economic impacts. Anaerobic Digestion (AD) – the breakdown by microorganisms of organic materials into biogas (40% carbon dioxide and 60% methane) and liquid & solid digestates – offers a potential solution.

4.31. The methane element of biogas (and the dewatered solid digestate) can be used to generate electrical and heat energy. A recent development is the potential to use the biogas as a fuel in motor vehicles, to replace diesel. Sweden already operates a number of biogas-fuelled bus fleets and has recently announced the introduction of a biogas-fuelled train. The non-gaseous products resulting from AD can have economic value as fertilisers and soil conditioners. However, the industry reports that the lack of a UK-wide certification standard for digestate is acting as a barrier to the development of the industry in the UK. Such a standard would give confidence to farmers and satisfy new Environment Agency regulations on spreading waste on land.

4.32. The UK's sewage sludge digestion and landfill gas systems are well developed. A range of AD technologies are utilised by the sewage sludge industry which, as well as meeting the main objective of reducing the amount of waste material for final disposal, also generate renewable energy. In most cases a proportion of the energy produced is cycled back in to power the process. In contrast, there are relatively few operational AD plants for

processing animal, municipal and food wastes in the UK. We are, however, aware of the greater interest in, and opportunities for, AD at the present time. This has been helped by both the UK's participation in the international 'Methane to Markets' Partnership and by the change allowing AD to contribute towards composting targets in Local Authority 'Best Value Performance Standards'. Other factors, such as the Landfill Allowances and Trading Schemes (LATS) targets for reducing the amount of biodegradable waste going to landfill, rises in landfill taxes, LATS fines for non achievement of targets, plus the provision within the Animal By-Products Regulations (2003) for AD to be used for catering and household kitchen waste and the financial support for the electricity element of AD systems within the Renewables Obligation, will also help to promote the use of AD.

4.33. There is, however, a need to encourage the use of more efficient designs of plant, particularly in the on-farm units. AD systems are available with more advanced technologies, comprising a 2-stage digestion process which is semi-optimised. These plants are reported to show improved conversion efficiencies over the single-stage systems[20]. In Germany there is a thriving AD sector, with over 3000 biogas plants producing 500 MW_e and a strategic plan for further major expansion. While German companies are at the forefront of developing the next generation of AD technology and routinely employ 2-stage systems for digesting animal wastes, it is understood that many of the units being developed for digestion of food wastes are single-stage (first generation) AD plant. It has been suggested that this approach is due to the relatively high level of subsidy currently enjoyed by such plants in Germany which, although leading to a significant expansion in AD capacity, has removed the need to optimise plant design.

4.34. It is our view that we need to achieve a similar expansion in AD capacity but with a greater focus on optimising plant performance towards reducing greenhouse gas emissions. Although research has provided strong evidence in favour of AD, it has been shown that AD systems can leak methane to the atmosphere. Also if, during the AD process, only a proportion of the potential biogas volume has been generated from the feedstock, the remaining digestate, when removed from the digestor and spread to land, will continue to degrade, potentially resulting in the further release of methane to the atmosphere. As methane has twenty-one times the potency of carbon dioxide as a greenhouse gas, minimising methane emissions should be a priority.

4.35. Much of the future expansion of the AD sector in England is likely to be focused around 'wastes': food wastes and the wet organic fraction of MSW and commercial/industrial wastes, due to the presence of 'gate fees'. It has been put to us that further optimisation of AD systems is pointless because the current financial returns to operators depend far more on the gate fee received for disposing of waste

[20] We have not provided AD plant conversion efficiencies in terms of percentage efficiency as they vary both with technology type and also with feedstock.

materials (75% of income) than on the income generated from the biogas and digestates (25%). While we understand the economic logic of this argument, it fails to recognise the wider, long-term environmental benefits to be gained from designing and running AD systems in such a way that the conversion rates of feedstock to methane are increased while methane emissions to the atmosphere are reduced. As in the previous section on 'Wastes', we believe that there is a need to move away from viewing waste-to-energy systems as 'waste disposal'. It is acknowledged that existing economics do not encourage the development of more environmentally efficient AD technologies; this is an issue which we will be asking Government to consider further.

4.36. It is envisaged that such a UK AD sector will encompass a range of plant sizes and uses, from the small-scale on-farm systems (e.g. c. 10KW), where feedstocks and products of digestion are mainly sourced and used locally, to larger scale centralised plants (e.g. c.1MW), where feedstocks will be brought in from a range of local farms and food processors to generate electricity for export onto the grid and heat for district heating systems. While the up-scaling of AD units will bring new challenges, such as the managing of increased transport movements, liaison with local communities, biosecurity of the digestate and location of AD plants close to major heat users, all of these potential issues can be addressed.

Recommendation 6

- The Government should review its current strategy for the Anaerobic Digestion sector. In doing so, we recommend that it considers practical and financial mechanisms for encouraging the expansion of the UK's AD capacity, while ensuring that new AD systems deliver the optimal balance between production of biogas and prevention of uncontrolled methane emissions.

Recommendation 7

- We support the industry's request for a PAS 100 Standard for digestate resulting from Anaerobic Digestion and recommend that the Government considers, seriously and urgently, options for progressing this.

Recommendation 8

- We recommend that the Government carries out an economic and environmental assessment of the potential of AD biogas as an alternative (renewable) fuel to displace diesel.

E. Co-firing

4.37. Co-firing of biomass with coal has the potential to expand significantly the use of biomass for energy, help develop supply chains and support the strategic development of energy crops. The Energy White Paper emphasised the importance of using such approaches to establish a wide range of renewable options and we hope industry will respond positively to this opportunity. As there will, in due course, need to be a review of progress towards the targets we make no further recommendations on the principles of co-firing. It will be important that post-2016 markets for energy crops and biomass have been developed in order to take up the supply of feedstocks once co-firing has come to an end.

4.38. There is an urgent need to resolve a number of issues concerning the practical implementation of co-firing to ensure that the rules on the use of biomass simultaneously facilitate sensible commercial practice and allow proportionate accountability. We are aware that industry sees potential to blend coal with biomass away from the power stations but that they have not, so far, been able to do this. DTI has, with industry, been looking at the off-site blending issue to see how it can be facilitated.

Recommendation 9

- The Government should act with urgency to remove the overly bureaucratic arrangements which are applied to co-firing. Specifically, OFGEM should:

– develop simple monitoring arrangements to facilitate off-site blending;

– introduce sampling arrangements which are appropriate, proportionate and fit good business practice; and,

– replace the end-of-month sampling and reconciliation procedures, taking account of relevant commercial practice with end-of-year reconciliations alone.

CHAPTER 5
PROVIDING STRATEGIC LEADERSHIP

A. Ownership of biomass in Government

5.1. The potential and benefits of biomass mean that it should be given a higher profile in sustainable energy policy.

5.2. Our view is that renewables policy in relation to biomass lacks clarity, given that different Government departments have different agendas and different understandings of the potential and use of biomass. The role and potential of biomass has not been well understood and there has been an over-emphasis on renewable electricity. Out-dated regulations have remained in place. To provide a sound foundation on which to build a biomass sector, the key elements needed include:

- A clear statement about the Government's strategy, identifying short, medium and long-term aims for the biomass sector with milestones and expected progress.
- Underpinning such statements with the development of streamlined support schemes and regulation which, when brought together, represent a credible holistic package aimed at strategic delivery of the sector.
- Commitment to support schemes for a period of time sufficient to underpin strategic development, build industry confidence, secure infrastructure development and begin to reduce costs.
- Implementation by all Government Departments.

5.3. We believe that the current fragmentation of responsibility for the various aspects of energy and climate change policy leads to a lack of ownership of biomass-related policies. This needs to be addressed. Devolution also impacts on the delivery of biomass renewables. We recognise that we have to work within current arrangements. There is a logic which says that DTI, as custodians of most of energy policy, should take the lead on biomass. But Defra's responsibility for elements of energy policy, sustainable development, rural impacts, waste and other feedstocks points to a role for that Department also.

Recommendation 10

The Secretaries of State for Trade and Industry and Environment, Food and Rural Affairs should take overall responsibility for the Government's commitment to act on the recommendations of the Biomass Task Force and should appoint Ministers in their Departments to lead jointly the detailed implementation. Within 6 months of publication of this report an implementation plan to take forward Task Force recommendations should be delivered to Government through the Sustainable Energy Policy Network and published.

B. Delivering the policy

5.4. For national policy to be successful it is essential to have focused regional delivery. Developers, at any scale of project, need to be able readily to access general information, advice, technical data, promotional material and information on grant funding and available capital. There is currently a lack of clarity about where to go for these services, making the situation confusing for those who wish to develop projects.

5.5. Delivery of the policy recommendations in this report would involve Regional Development Agencies, Regional Assemblies, Government Offices, local government and incorporate activities such as the Community Renewables Initiative and any other spin-off initiatives. Project development will inevitably need to link to Natural England and the delivery of land-based support. We have been impressed by the Energy Saving Trust's plans for a Sustainable Energy Network at the local level and the aim to create a one stop shop network where developers and their clients can access good quality information in this area.

5.6. Clearly there are a number of sound players in the field and it is extremely difficult to suggest that one is the lead organisation. RDAs are well positioned to lead this activity in the regions. At the national level both the Carbon Trust and the Energy Saving Trust play a key role in linking local delivery into central Government policy. The Carbon Trust helps business and the public sector cut carbon emissions and supports the development of low carbon technologies. It is developing its expertise in the area of biomass, in particular around the economics of biomass, supply chain risk, technology appraisal and market development. The Carbon Trust is planning to launch a number of technology acceleration projects in biomass for heat, which should also broaden its capability on biomass more generally. As this capability evolves, the Carbon Trust will be able to act as a centre of expertise and provide sign-posting for business and public sector organisations developing biomass opportunities. Energy Saving Trust targets households, small businesses and the public sector and addresses energy efficiency, small-scale renewables and issues about vehicles. There is, amongst stakeholders, a degree of confusion about the precise roles of these two organisations and a perception that there is a gap between small and larger scale enterprises.

Recommendation 11

Government should establish the Carbon Trust as the national focus of knowledge and analysis on biomass energy for dissemination by the RDAs.

Recommendation 12

Government should ask the Energy Saving Trust, in addition to its existing work on small-scale renewables, to take a role in providing information to address the current lack of knowledge and awareness of biomass energy.

Recommendation 13

To help the development of biomass energy, Regional Development Agencies should, with regional partners and by June 2006, set targets for delivery of carbon savings in their region, for which biomass will form an important part. RDAs should consider delivery through a limited company based on the model developed by EEDA and SWRDA and must embrace all renewables groups in the regions and maximise use of public funds by minimising duplication.

Recommendation 14

Carbon Trust and the Energy Saving Trust should provide annual reports on progress and work closely with the RDAs as the regional delivery partners. By April 2006 they should set out for stakeholders their respective roles and if gaps are identified explain how they will be filled.

C. Getting the message clear

5.7. There have been regular and repeated statements of the Government's long-term commitments to the use of biomass as a renewable energy source and some development funding has been in place since the days of the Non-Fossil Fuel Obligation. But the biomass industry considers that this has not been underpinned with action to achieve strategic development. This mismatch has led to the view in the biomass industry that there is no clear, long-term message about what the Government wants to deliver.

5.8. A stop-start approach to development has been in evidence through a multiplicity of biomass grant schemes, some put in place opportunistically rather than strategically, and this is taken as evidence of a lack of a clear strategic approach.

5.9. Future energy scenarios suggest that it will be necessary to harness and develop all renewables options. As targets become more challenging the cost of delivering carbon savings will inevitably rise and action taken now will position biomass strategically for further development. To secure industry confidence it is essential that the Government sets out a clear strategic message on the future role of biomass energy.

Recommendation 15

The Ministers given responsibility for biomass energy should, in the response to this report, detail the percentage of energy supply the Government expects will be developed from biomass by 2010 and 2020 and detail the proportion that should come from the public and from the private sectors.

D. Public procurement

SUSTAINABILITY ON THE DEFENCE ESTATE

The Ministry of Defence is committed to holding its estate in trust and on trust for the Nation, balancing support for operational capability with managing a large and diverse estate With some 240,000 hectares in the UK and annual carbon emissions from energy of 0.43 million tonnes, the MOD by necessity takes its responsibilities for sustainable development seriously. MOD has recognised the need to raise awareness and understanding of renewable energy, better design and alternative technologies. Energy, and alternative sources are considered throughout the decision and design process. Sustainable development appraisal tools, a partnership with the Carbon Trust and increased collaboration with its construction industry partners are all part of the MOD approach.

A range of appraisal tools and evaluation methodologies are mandated for use by MOD and it's industry partners. Strategic Environmental Assessments look at the impact of programmes and plans and assess energy requirements against wider government policy objectives. Sustainability Appraisals at project level ensure the potential to improve energy efficiency, promote the use of renewables and explore procurement of energy generated in environmentally acceptable ways are addressed. At site level energy management is addressed through the application of an assessment appropriate to the building type.

The achievements of the MOD are perhaps best explained by illustration:

- To explore alternative sources of fuel and technology on its estate, the MOD has worked with the Carbon Trust to examine the feasibility of biomass. At Castlemartin Army Training Estate in Pembrokeshire, Wales, a study into a small-

SUSTAINABILITY ON THE DEFENCE ESTATE continued

scale wood-fuelled biomass energy generation plant (80kWe/150kWth) has been undertaken. The possibilities of developing a local supply chain for biomass fuel are being explored with the Forestry Commission. Potential sources include the timber 'firing targets' used on the training area and wood chip from MOD's forests.

- Other renewable energy projects include the use of two active solar thermal systems at the Royal Marines Norton Manor Camp and a new 'ambient energy' heat pump system has recently been completed at Royal Marines Condor.
- A new 'super-mess' building at HMS Naval Base at Faslane is using new technology to harness solar energy for dining and recreational facilities for 2,500 military personnel. The naval base will be at the forefront of the 'take-up' of solar technology. The installation, which supports of the Government's photovoltaics demonstration programme, comprises three photovoltaic arrays made of Unisolar laminates bonded onto a Kalzip roof. The array will generate 49.9 kilowatt peak (kwp) of electricity.
- At the Meterological Office Building in Exeter a number of designed solutions, such as heat exchangers in the air-handling units, motion detection on the lighting, and special solutions for windows and walls are all being used to minimise energy use. A Combined Heat and Power (CHP) plant on-site ensures a sustainable provision of power. In order to passively improve the energy performance of the building, the "TermoDeck Ventilation System" is being used. In this system, the mass of the building is used for heating or cooling.

5.10. The Energy White Paper showed that the Government recognised it has a vital role to play in leading by example[21] and the Government Estate alone is said to comprise 50,000 buildings[22]. It has established a Sustainable Procurement Task Force to bring about a step change in sustainable public procurement. We see considerable possibilities for the public sector to increase the amount of investment both in heat networks and in standalone biomass-fuelled boilers for heating. Public sector ownership of large buildings provides an opportunity to progress the use of biomass. These possibilities are greatest where public sector facilities – schools, government buildings, hospitals – are off the gas grid, but confining investments to off-grid cases would be unnecessarily limiting. Substantial progress can only be made if biomass investments are made in mainstream circumstances, though equally due recognition of the particularities of biomass is needed. Hospitals have potential to develop biomass CHP systems using the grid as the back up energy source. Gasification-based systems could also deal with clinical waste.

[21] Energy White Paper, Chapter 3, paragraph 42

[22] The Government's Approach – delivering sustainable development together – www.sustainable-development.gov.uk

Kingsmead Primary School
"Taking care of tomorrow, TODAY"

Kingsmead Primary is the first school in Cheshire to be built with a biomass heating system. It is Cheshire County Council's flagship sustainability project, set to become recognised as a local and national exemplar of sustainable construction and successful delivery through working in partnership.

Other key players involved in delivery of the project were the Department for Education and Skills, North West Development Agency, Cheshire Renewables, and a design and construction team led by Willmott Dixon.

Kingsmead will use less than one quarter of the energy consumed by a typical primary school. It has a 60 kW biomass heating system supplied by Talbott's of Stafford which will provide 60% of the school's heating needs. Initially 12mm wood pellets will provide the fuel supply but there are plans to move to locally sourced wood chip.

Over a decade the school will save 30 tonnes of carbon, around half of which will be contributed by the biomass heating system.

Kingsmead provides an excellent tool to raise awareness amongst pupils, parents, teachers and the wider community of sustainability and biomass energy issues.

5.11. It would be easy to suggest that the way forward would be for public sector investments to include a notional stream of returns based on assumptions about the value of carbon savings. And yet it is inevitable that public sector investments will be viewed through the filter of the analysis of "value-for-money". Moreover, many important investments are now made as part of public/private partnerships, and so will be required to meet rigorous standards of cost effectiveness. We understand that HM Treasury guidance on investment decisions shows that the policy now is to take account of whole life cycle costs, both capital and operational, and non-market factors such as delivering environmental benefit. It does seem, therefore, that PFI rules do not stand in the way of developing biomass projects, though they are still perceived to be a problem by many in the design and construction industry.

5.12. The Barker report[23] sets out a range of recommendations on future housing supply and the functioning of the housing market, this in the context of growing demands for housing. The benefits of biomass energy can be enhanced in energy efficient buildings which reduce peak loads on heating systems, require smaller boilers and, consequently, make more cost effective use of capital and grants. The Code for Sustainable Buildings will be issued in early 2006 and this presents an opportunity to be taken, not missed. The Task Force considers that:

- The remit of the Code must incorporate the use of renewable energy sources, and the value of potential carbon savings, as a qualifying condition for the higher levels of the Code.
- The use of renewables should count as an energy efficiency measure to incentivise schemes for improving the environmental performance of buildings.
- In public procurement there should be a presumption, which must be monitored and enforced, that renewables will be used to provide energy, with the requirement to consider the direct use of renewable energy in preference to the indirect use of renewable energy by way of contracts with electricity suppliers.
- An awareness campaign should be developed for decision-makers in the public procurement process and should specifically remove incorrect perceptions about the PFI.
- Regional public procurement exemplars should be developed.
- Government departments, agencies and others should report annually on progress with the installation of renewable energy sources, including biomass, in their buildings.

Recommendation 16

The Government must include the use of biomass and other renewables in policies on sustainable buildings and in the remit of the Code for Sustainable Buildings.

Recommendation 17

The Government should aim to deliver higher standards of sustainability through maximising environmental benefits with a programme of positive preference which requires all new build and refurbishment in the public estate to consider fully the use of biomass. This recommendation links to the use of biomass heating in schools and the potential to raise awareness.

Recommendation 18

The Government Office in each region, together with the RDA and Regional Assembly should, in partnership with other Government bodies, jointly commission a survey of all the government buildings within their region and their respective heating systems. The survey should provide details of the heating boiler type, fuel requirement, age and timing of replacement for each of the buildings. It should also identify those boilers which are eligible for replacement by renewables and, in the context of this study, by biomass in particular. A programme for these conversions should be produced and executed.

[23] Barker Review – Delivering stability: securing our future housing needs, HM Treasury website.

Defra Worcester

A new wood chip boiler has been installed in the canteen at Defra's Worcester site. This boiler project aims to set an example and help promote biomass systems as a common consideration. Defra's Rural Development Service decided it was important to give a lead with projects such as this.

The 90 kW boiler will require over 50 tonnes of woodchips each year. A fuel supply group is being set up through the Defra's Energy Crops Producer grant under the Energy Crops Scheme. The group will build on the expertise of local suppliers.

The cost for the project was high at £136,000 with no grant available (as a core Government building) but value for money will become clear as the benefits are shown through the environmental return, promotion of alternative cropping and via sustained rural employment and in relation to rising oil prices.

The boiler will use woodchip from short rotation coppice and is anticipated to save up to 5.4 tonnes of carbon every year, based on six months' winter use and taking into account emissions generated from planting, harvesting, processing and transporting the fuel.

Recommendation 19

Each Department, RDA, GO and local authority should, within 6 months of this report, set and publish ambitious carbon targets for 2010 and 2020 for the use of renewable heat, electricity and CHP in its buildings with the direct use of renewable energy being preferred to the indirect use of renewable energy by way of contracts with electricity suppliers. Targets should include schools, hospitals and other buildings in public ownership.

E. Planning regulations and local authorities

5.13. Planning Policy Statement 22 on Renewable Energy sets out national policy for different aspects of land use. With its accompanying guide PPS 22 is intended to encourage the appropriate development of further renewable energy schemes. Regional Spatial Strategies and local planning documents are intended to promote rather than restrict such developments. There is scope to assess wider environmental and economic benefit. Small-scale projects and community involvement are positively encouraged.

5.14. The implementation of national policy at regional and sub-regional level will always be challenging. Local authorities can feel vulnerable to legal challenge (and associated costs) if they are too prescriptive with developers. But there is the potential that greater engagement at the local level would focus thinking and help the development of local solutions. And there is potential to use planning obligations through Section 106 of the Town and country Planning Act 1990 to secure local development plan policies on renewables.

5.15. This is not an area where we would expect national Government to be prescriptive. Planning is devolved to local authorities for good reasons and we would not seek to interfere in the principles which underlie current arrangements. Having said that, delivery of national targets depends on action at the local level. In respect of the development of renewables, London has set an excellent example for the rest of the country by requiring that new developments achieve a target of 10% renewables. Given that this process has withstood legal challenge and that PPS 22 enables local planning authorities to set such targets in local development documents for new residential, commercial or industrial developments, we propose that the local authorities each set such targets for renewables, including biomass.

Barnsley District Council

Barnsley District Council is actively supporting the development of biomass heating for environmental and cost reasons.

A trial reported on in April 2005 showed that, compared to coal, biomass pellets increase combustion efficiency. Boilers have greater heat retention as a result of not having to open fire-box doors for de-ashing and other maintenance. The reduced air requirement for combustion reduces flue gas volumes.

Costings show that for a 450kW boiler operating over a 25 year period, the operating costs of biomass and coal systems would be £300,000 and £500,000 respectively. The use of biomass would save nearly 2,000 tonnes of carbon.

Barnsley has adopted a policy of positive preference for biomass heating for new installations in public and commercial buildings.

Recommendation 20

Local authorities should review local development plans, regional strategies and policies and incorporate positive sustainability measures. In particular, they should comply with paragraph 8 of Planning Policy Statement 22 (PPS22) and set a target for a percentage of on-site renewable energy development to be used in new residential, commercial or industrial development. Government scrutiny of emerging development plans will provide an opportunity to ensure that the guidance in PPS22 is being followed.

Recommendation 21

The Government should encourage local authorities to use planning obligations to implement local planning policies on establishing district heating systems, based on biomass and other renewables, which are underdeveloped in the UK and have potential particularly in new build.

F. Regulatory issues

5.16. There are a number of regulatory issues which are barriers to the development of biomass energy and which the Government could remove at no or low cost.

Recommendation 22

Building Regulations, Part J does not recognise that biomass systems are not radiant heat devices. The regulations require unnecessary measures – extending flues, fitting heat pads for heaters to stand on. Building regulations should be updated to take full account of the specifications of biomass systems.

Recommendation 23

The Clean Air Act requires approval for heat boilers used in smoke free zones. Each model has to be tested, which is expensive and can take several months, for exemption under the Act even though the European standards which appliances have passed are said to be more stringent than the Act. Government should review this requirement and develop a simplified approvals system for boilers and the fuels they burn which removes the need for individual testing of boilers.

Recommendation 24

Part L of the Building Regulations on conservation of fuel and power deals with boiler technologies. Biomass systems are included with solid fuels installations but it is essential that the guide to heating systems, which is being produced by Heating Equipment Testing and Approvals Scheme (HETAS), must deal with biomass heating systems in detail. We recommend the Government ensure that the biomass industry is represented on the working party producing the guide.

CHAPTER 6
UNDERPINNING DELIVERY

A. Awareness raising

6.1. There is a low level of awareness abut biomass energy which, as a consequence, has a low profile amongst the renewables mix and is seldom referred to when renewable options feature in the media. Installing biomass heating in schools through the public procurement route is the best educational tool available to Government and it will provide a source of good exemplars for use in other publicity. The Eden Project will also provide another good exemplar.

Eden Project

Eden Project are planning to install a 300kW biomass boiler catering for the heat load at Eden for 50% of the year whilst providing a market for local suppliers of energy biomass (miscanthus and woodchip). The installation will be more cost effective than the current gas boiler arrangement and it will act as a high profile demonstration site for this technology, promoting further installations and markets for Cornish suppliers of biomass.

A 300kW biomass boiler operating 24/7 represents a carbon footprint saving of 204 tonnes per annum, a 45% reduction in carbon emissions on Eden's heating load.

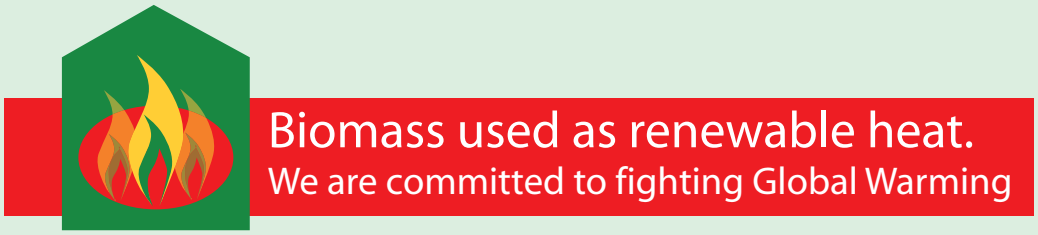
The installation will cost £175,000. Eden has secured £64,000 from the Clear Skies Initiative and £76,000 from a mixture of Defra and European Agricultural Guidance and Guarantee Fund. The balance will come from Eden's own funds.

6.2. The lack of awareness has been evident during our information gathering work when we have, at times, found it difficult to get some stakeholders to respond to requests for meetings. In most cases, but not all, it has proved possible to overcome initial reluctance.

6.3. There are other important target groups including project developers, energy managers, planners, architects, quantity surveyors and engineers. All of these groups need access to technical information, supply chain economic data, data on fuel supply quality standards and best practice information on exemplars. Our discussions with the Royal Institute of British Architects showed a need for hard evidence on costs and benefits, a central source of expertise, and information; the development of exemplars would also help. There is also

a need for the general public to understand better the potential of waste as a resource, rather than simply see waste as a problem.

6.4. One way to raise the profile of biomass is to establish a logo for use on biomass boilers. This would signify the environmental potential in the development of renewable heating from biomass resources. It would be a visual reminder to the general public of the environmental benefits which the use of such heating systems can deliver. A possible option is shown below.



Recommendation 25

The Task Force recommends that technical, economic and best practice information be brought together by June 2006 and made available and sent to key stakeholders. The Carbon Trust, Energy Saving Trust, RDAs and Regional Assemblies should include biomass energy awareness raising amongst current publicity and promotional work. The development of biomass heating in schools should be used as an opportunity. Awareness raising should include information on the potential of biomass from waste.

Recommendation 26

Trade associations and representative bodies should take opportunities to promote the work of the Carbon Trust and the Energy Saving Trust and signpost the information which is available from those organisations on biomass.

Recommendation 27

The Government should consider the development of a logo for biomass heating boilers to signify the link with the environmental benefit being delivered.

Econergy Limited

Econergy Limited have installed two state of the art Froling Turbomat boilers in the Union Street flats in Barnsley. Totalling 470 kW, these boilers are fully automatic in terms of ignition, ash and soot extraction, boiler tube cleaning and full modulating control. The boilers are 90%+ efficient and can take woodfuel up to 50% moisture content.

The boilers have been installed along side new standby / peak gas plant and replace old coal boilers.

The boilers supply a community district heating network for three blocks of flats. The projected fuel demand is 530 tonnes per year. Compared to mains gas these boilers are expected to deliver an emissions saving of 87 tonnes of carbon each year.

The biomass boilers and fuel feed system cost around £130,000 and the project is supported by a grant from the Bio-energy Capital Grant Scheme.

B. Developing supply chains

6.5. Our feedstock tables show the importance of the forestry resource. Supply chains and their infrastructure have the potential to develop as the biomass energy market develops. The role of co-firing has already been mentioned but, in part, change can also be driven forward through the public procurement option discussed in paragraphs 5.10 and 5.12. The Bio-energy Infrastructure Scheme recognised the need to kick-start the development of supply chains and was a positive step at a time when some markets were struggling to develop. If Government puts in place the correct mechanisms to develop markets for biomass then those markets will, in time, pull through the necessary infrastructure without the need for further grant support. However, it is our view that there is still a need to support further the initial phase of development with grant support. And RDAs must take a lead in facilitating the development of supply chains in their regions.

Recommendation 28

To facilitate rapid initial development of supply chains we recommend a second round of the Bio-energy Infrastructure Scheme be run with grant funding of £3.5m.

Recommendation 29

Each RDA should analyse the infrastructure needs in its region and seek to facilitate supply chain development. Each RDA should submit, to the Ministers given responsibility for biomass energy, a plan on how they intend to do this by October 2006.

C. Feedstocks including short rotation forestry

6.6. We have received submissions about the future potential of short rotation forestry but perceive that there is a risk of a fragmented approach developing. Some have concerns about the introduction of non-native species into the UK. Others are keen to get on with planting and production. We understand the Forestry Commission will publish a review of a range of potential short rotation forestry candidate species for the UK in October 2005.

6.7. There is an urgent need for the Government and the industry to develop a planned approach to short rotation and other forestry. This will need to take account of plans for the replacement of conifer plantations with broadleaf trees and the potential to use tops and roots as biomass energy feedstocks. An integrated plan taking account of other feedstocks would need to follow and incorporate the work on forestry.

Recommendation 30

As a first step the Forestry Commission should urgently undertake and publish a full assessment of, and set out a strategic plan for, the development and use of short rotation forestry, forestry waste, farm and other woodlands, local authority trees and commercial forestry. This should be delivered by September 2006.

Recommendation 31

The Government should then consider the development of an integrated plan to optimise the use of the full range of biomass feedstocks including wastes.

D. Energy crops

6.8. Energy crops have been a victim of the stop-start approach to biomass energy which has been in evidence in Government. This has created uncertainty in the industry and has not led to the level of progress needed to pull through the new varieties which have been in development. There is a need to ensure that biomass energy is driven by market development and has access to a full range of feedstocks which offer the potential to utilise the most appropriate feedstocks for the situation. The investment which some in the industry have made in response to Government direction to develop energy crops as feedstocks for heat, electricity and in co-firing has to be recognised.

6.9. The European Commission has consulted on the development of an EU Biomass Action Plan and discussions so far have touched on a number of issues with which the Task Force readily identifies. These include linking carbon to fiscal support, harmonising quality

standards, promoting heat from biomass and promoting bioenergy through the Common Agriculture Policy. We consider this last issue to be significant in that whilst the UK has sought to develop the production of energy crops the supporting regulations, on rural development in particular, have been unhelpful. For example, whilst it has been possible to support the development of producer groups for short rotation coppice growers there has been no similar provision for growers of miscanthus.

6.10. Energy crops, and other non-food crops, do also have potential for use as a route for recycling effluent. They provide an option for disposal of organic wastes and effluents. This can improve the profitability of crops and also provide solutions for non-agricultural communities whilst, at the same time, delivering biodiversity benefits.

6.11. We are also concerned that the operation of the Entry Level Scheme (ELS) does not properly reward energy crops for the biodiversity benefits delivered. Further work is needed to improve the compatibility between the Energy Crops Scheme and the ELS so that farmers growing large areas of energy crops can more easily join the ELS

Recommendation 32

The Energy Crops Scheme should continue in the next Rural Development Programme for England and should include planting grants and producer group support in order to build on the investment which has already taken place and to ensure the widest possible access to a range of feedstocks.

Recommendation 33

The Entry Level Scheme should be amended to recognise the biodiversity and other environmental benefits of energy crops.

E. Common Agriculture Policy

6.12. It is important that mechanisms to promote bioenergy in the Common Agriculture Policy are well thought through. The continuation of set-aside and the bureaucracy associated with the €45/hectare energy crops payment are regarded by many as market distortions and barriers rather then helpful support. There is an important need to ensure co-ordination in Brussels across the various Directorates General to facilitate the introduction of appropriate support by Member States. Strategic plans, such as the Biomass Action Plan, need to be followed up with appropriate regulation to help stimulate activity.

Recommendation 34

The Task Force recommends that in taking forward the EU Biomass Action Plan the UK engages in a review of current regulations and discusses with the European Commission the range of feedstocks – crops, waste, forestry – and the changes needed to existing legislation to facilitate the use of those feedstocks as energy sources, as well as the need for the proper co-ordination between the various Directorates of the EU with a nominated Directorate to assume lead role.

F. The workings of the electricity market

6.13. The Government's recently issued Consultative Document on the Renewables Obligation[24] contains a number of proposals which have implications for the additional use of biomass in electricity generation. We naturally support any recommendations which are likely to have the net effect of optimising the efficient the use of biomass. It will also be apparent from the statements we have issued throughout our work that we also support any proposals to simplify the administration of the scheme. In this respect we would support any move away from the 98% rule since this should have the effect of allowing other waste streams – notably wood wastes – to qualify as "pure" biomass. It will be for the Government, advised by the industry, to decide on the new limit.

6.14. A persistent topic, put to us throughout our work, is that the requirement that generators largely sell their electricity to licensed suppliers is a barrier, in that where ROCs are involved independent generators are not able to capture their full value. As things are currently organised under the 2000 Utilities Act, it is inevitable that this will be so. Changes in the supply market since the Government re-organised the energy market in 2000 may have reduced choice and value still further. However, as Woking Council has shown (and the Mayor of London is proposing to replicate) other choices do exist outside the ROC market through local supply of power to dedicated users. We understand the Government is reviewing further the potential for such developments to occur as a result of changes in the licensing regime.

6.15. Vertically integrated companies can protect themselves in the ROC market, since their own renewables investments help to offset their obligations as energy suppliers. In contrast, non-integrated and small renewable projects face the risks of uncertain ROC prices. A result of this uncertainty is to increase the required rate of return on new projects. These are all issues for the RO review, and not for us, though we have contributed to that review, and we support efforts there to make it easier for small generators to benefit from the Obligation.

[24] Renewable Energy: 2005/6 Review of the Renewables Obligation Statutory Consultation Document, DTI, September 2006

Recommendation 35

The Task Force supports the Government's efforts, in the review of the RO, to find a simple and straightforward way to help facilitate the development of smaller-scale generation. The Task Force recommends that the Government take forward the RO review proposals that agents be allowed to act on behalf of small generators and to amalgamate the output of small generators and that the requirement for sale and buy-back agreements be removed.

6.16. Changes to the RO which improved the competitive position of small companies would, of course, improve their prospects for obtaining project finance from third parties. Small ventures will, even so, inevitably continue to find life difficult. The best prospects for small companies may be in places where there are niche markets that can be developed as a result of local knowledge and advantage, e.g. access to a local fuel resource. Given transport costs, some biomass projects are likely to fall into this category. Even so, many renewables projects will remain too small to interest mainstream banks: the total investment is small and the balance of risks and rewards is often perceived as unfavourable. Further, the lack of type approval of systems has an impact on risk and due diligence work.

6.17. One solution may be to encourage the growth of intermediate companies aiming to build up a portfolio of investments in small companies. There are already examples of such companies investing in wind energy and proposals in the biomass field. The advantage is that such companies are able to agree long-term power purchase agreements for the sale of electricity that would be unavailable to their constituent parts. It is to be hoped that such vehicles could be developed to include investment in biomass-fired plants.

6.18. It seems not to be well known that there are rules which oblige host generators to take electricity onto the system from exempt generators for transmission to customers. The Electricity (Class Exemptions from the Requirement for a Licence) Order 2001 governs the exempt licensing regime, which enables exempt generators, distributors and suppliers to supply electricity that they generate and distribute themselves directly to customers rather than to a licensed supplier. An exempt generator can generate up to 50MW of electricity per site without Secretary of State approval and up to 100MW with Secretary of State approval. They can distribute and supply exempt electricity from each generating site directly to customers, on site and over private wire up to 50MW (or up to 100MW) of which no more than 1MW (1,000 households) can be supplied to domestic customers. An exempt generator can distribute and supply exempt electricity directly to customers over public wires up to 5MW in aggregate of which no more than 2.5MW can be supplied to domestic customers. We understand these arrangements are to be reviewed by DTI and Defra.

G. Quality standards and certification

6.19. It is important to have feedstocks which are fit for purpose and delivered to a quality standard and specification. This is essential to creating and underpinning consumer confidence. International comparisons in particular have emphasised the need for supply chains to develop which ensure that feedstocks of appropriate quality are used in conversion technology. Clear technical specifications are needed which can be incorporated into supply contracts. We are aware of work in place to develop specifications and standards – CEN TC335 for solid biofuels and CEN TC343 for solid recovered fuels – and the British Standards Institute committee engaged on this. We are also aware that BRE and the British Pellet Club are seeking to develop a Wood Pellet Accreditation Scheme based on the CEN technical specifications.

Recommendation 36

The Task Force recommends that the European standards which are being developed – CEN TC 335 and 343 - are adopted as the basis for the UK standard for these fuels.

Recommendation 37

It is important that the detail of these standards are disseminated as fully as possible and this needs to be incorporated into the activities we identify in paragraphs 6.1 – 6.3 dealing with awareness raising.

6.20. The assessment of the net energy benefits and the environmental impacts of the use of crops for fuel, including the carbon benefits, is key to the development of both public and private sector policies. Approaches based on Life-cycle assessment (LCA) are widely used. Life cycle assessment is an established technique for quantifying the total environmental impacts of the provision of a product or service from original resources to final disposal, or so-called "cradle-to-grave". Many of the approaches and conventions incorporated into life cycle assessment have their roots in the principles of energy analysis. Its practical use in informing energy policy has been enhanced by the creation of an official framework for life cycle assessment in the form of the International Standard ISO 14040 series (Refs. 10 to 13). This framework establishes the definitions and conventions of life cycle assessment, and provides practical advice on methods of calculation.

6.21. Life cycle assessment focuses on a "functional unit" which provides a clear and definitive description of the product or service which enables subsequent results to be interpreted correctly and compared with other results in a meaningful manner. In the energy area, the functional unit could be a kilogram or litre of a transport fuel, a unit of primary energy (GJ or tonnes of oil equivalent) delivered to a power station, or a unit of electricity. LCA is

based on the life cycle inventory analysis (LCI) which quantifies relevant inputs and outputs of the life cycle of a product or service. Various life cycle inputs and outputs must be quantified, including energy resources, such as fossil fuels, and emissions to atmosphere, such as CO_2 and other GHG.

6.22. Product or service life-cycles are complex so LCA and LCI studies of crop based products involve, for example, the analysis of data on energy used in fertiliser production and nitrogen emissions from soils. The calculations are affected by assumptions about the crop yields achieved, the crop management and processing inputs, and the fossil fuel replaced. The use of LCA in the study of bioenergy systems is now well developed and a number of studies have applied LCA methodology rigorously to compare bioenergy supply chains. They show a clear advantage for perennial woody crops grown for electricity and heat in terms of per hectare net energy yields, energy balances, and greenhouse gas abatement effects compared with the use of annual crops for liquid biofuels based on vegetable oil for biodiesel, or starch and sugar for bioethanol.

Recommendation 38

LCA work is taking place, following the Strategy for Non-Food Crops and Uses, to develop a central life cycle inventory database to support the sustainable development of the sector. The Task Force recommends this be expanded to incorporate biomass energy issues. In implementing the recommendation thought should be given to the development of wider international partnerships, for example, with Canada, and other work in bodies, such as the International Energy Agency, to establish the base assumptions in any evaluation process.

H. Biodiversity

6.23. The long-term development of biomass needs a strategic approach on biodiversity and other impacts. We understand that discussions are taking place between Government and the environmental agencies about the possibility of making some information available for strategic environmental impact assessment. This could complement the Environment Agency's biomass assessment tool (BEAT) which looks at the very high-level energy crop requirements and impacts for new biomass plant. It would give indicative information on issues such as soils, designated and historical sites and weather.

Recommendation 39

The Government should continue to make a priority of work to develop the information needed, together with appropriate guidelines, to undertake strategic environmental impact assessments for biomass and should consult fully with environmental and other groups with an interest.

I. Research and Development

6.24. Government investment in R&D in the biomass sector, including forestry and energy crops, has been at a significant level for a number of years. In addition there is funding which is directed at the development of equipment and plant in order to improve efficiencies. But it is extremely difficult to establish precisely what resource is allocated to all this activity. There is additional funding from the RDAs as well as the European Commission. Work covers the spectrum from basic research to near-market commercial activity and from issues affecting feedstocks to technology development.

6.25. The Renewables Innovation Review raised concerns about the complexity of these arrangements and identified the need for all of the bodies operating in the sector to understand their roles better. Currently R&D is funded and/or undertaken by the Research Councils, universities, Government departments, research organisations, RDAs, the Forestry Commission and industry. It is essential that biomass-related R&D is better co-ordinated across researchers and funding bodies. We understand the UK Energy Research Centre (UK ERC) was established to provide a focus for energy research in the UK and to bring cohesion to diverse R&D activities through a National Energy Research Network. UK ERC is creating a UK Energy Research Atlas which will describe the landscape of energy R&D activity in the UK. The first version will be available in April 2006 and will identify biomass as a discrete topic; this should be a useful information tool. Over time, the UK ERC will extend its networking activity to take in R&D at the applied end of the spectrum.

6.26. The Task Force was impressed by the structure of biomass research in Finland where work was carefully co-ordinated through Tekes and VTT in order to link academia with industry and avoid duplication and secure value for money. We are aware of the work of the Interdepartmental Funders' Group on Bioenergy Research Committee which has tried to bring similar discipline to crop-related biomass R&D, one element of the whole, funded directly by Government.

6.27. The Task Force has identified conversion efficiencies as an important issue. For electricity generation there has been a degree of emphasis on new technologies with potential to deliver more efficient conversion. But the Arbre experience has a real and serious impact on confidence. At this early stage in the development of a new industry there is a need to use the sound foundation of proven technology to establish supply chains and proceed by evolution rather than by trying to provoke revolution. At the same time it is important, in parallel, to put in place the R&D which will help demonstrate and deliver the new technologies.

6.28. In any developing industry there is a need to keep up to date on progress with technology. In the UK there is a perception that gasification technology is not at the stage of commercial development. In contrast, we saw in Finland good examples of working gasifiers and were told that gasification is regarded as today's technology there. A good awareness of the stage technology development has reached will also prevent R&D resources being spent unnecessarily in fruitless studies.

Recommendation 40

Drawing on the work of UK ERC and their advice, the Government should review the range of research and development linked to biomass energy and develop a strategic plan from basic through strategic to applied research, and including technology development. The work should assess whether current activity is well focused and well co-ordinated, ensure that procedures to avoid duplication are in place and ensure the programme delivers value for money.

Recommendation 41

In the energy crops sector the performance of new varieties is crucial to delivering economic viability. Defra should make proposals for the development of arrangements which will ensure such performance data are readily available and published and that the government funded variety development work is taken forward by industry.

J. Training and skills

6.29. With any infant industry there is likely to be a lack of skilled operatives able to install and maintain equipment. This lack of trained engineers for the installation, commissioning and servicing of biomass systems needs to be addressed in order to underpin growth in the sector. There is a need to consider both qualifications and competence schemes for engineers.

Recommendation 42

The Task Force recommends that DTI asks the Skills for Business Network to arrange for the relevant Sector Skills Councils to identify the skills and training needed for the entire biomass sector from production to the final delivery of the energy. This should lead to the preparation of a sector skills agreement which will fully define the need and set out how training and skills development will be delivered.

CHAPTER 7
THE COST OF OUR RECOMMENDATIONS

7.1. Renewables currently accounts for 1% of the heat market. Future Energy Solutions suggest[25] that renewables could add 0.8% and 4.7% to the heat market by 2010 and 2020 respectively. With the package of support measures and actions set out in this report we believe that can be improved on and that it should be possible to increase the renewables share of the heat market to 3% and 7% by 2010 and 2015.

7.2. We make two recommendations with a direct cost to the Exchequer. Our proposals for grant support to develop biomass heating will cost in the range £10-20 million per annum. And on supply chain development we have proposed a further round of the Bio-energy Infrastructure Scheme with funding of £3.5m.

7.3. Some of our other recommendations do have cost implications for Government Departments and others but we assume that there is no prospect of increases in budgets and that these will be dealt with through a prioritisation of activities and within existing budgets.

7.4. The lack of progress by some projects in the Bio-energy Capital Grants Scheme means that there is unspent funding of £11.4m. We recommend that this be reallocated to the biomass priorities identified in this report. We are also aware that when the climate change levy was introduced the intention was for annual uprating but it has not been increased since introduction.

7.5. Finally, we understand DTI has funds unallocated since the last spending round and that Department will wish to consider options contained in the recommendations in this report.

Biomass Task Force
October 2005

[25] Renewable Heat and Heat from Combined Heat and Power Plants – Study and Analysis, Future Energy Solutions (FES) from AEA Technology, August 2005

LIST OF RECOMMENDATIONS

Recommendation 1

The Task Force recommends that the Government urgently introduce a single capital grant scheme to grant aid all biomass heating boilers and the heat element of CHP biomass-fuelled plants. We propose that the grant be fixed at 40% of capital expenditure of the boiler or CHP equipment, including the associated infrastructure needed, for 5 years and that progress be reviewed after 4 years. CHP grants should support capital expenditure in proportion to the percentage of power exported as heat.

Recommendation 2

In order to recognise the carbon value of biomass heat the Government should consider and report on potential mechanisms for long-term support including the EU Emissions Trading Scheme, Climate Change Levy and the Energy Efficiency Commitment.

Recommendation 3

The Task Force recommends that the Government initiates an awareness raising programme which promotes waste as a valuable asset and which actively encourages the efficient and safe recovery of energy from waste (post re-use and recycling). In parallel with this process, and working with the waste industry, the Government should develop a strategic plan for the use of energy from waste, focused on those plant types which optimise carbon savings and the off-take use of heat and electricity. Appropriate measures, which would actively encourage such developments, should be considered. This should be fully reflected in the Government's Waste Strategy.

Recommendation 4

The Government should set up a strategic group within the Waste Implementation Programme to take forward the development of wood waste as an energy source. This group should include representation from WRAP, given its knowledge of the recycling industry and expertise in industry development.

Recommendation 5

Government should continue to fund, at an appropriate level, the work of the Waste Technology Data Centre, at the Environment Agency. Their ongoing analysis of waste technology performance is key to ensuring that waste incineration plants can reliably meet performance, environmental impact and financial specifications, and so build confidence in the emerging industry.

Recommendation 6

The Government should review its current strategy for the Anaerobic Digestion sector. In doing so, we recommend that it considers practical and financial mechanisms for encouraging the expansion of the UK's AD capacity, while ensuring that new AD systems deliver the optimal balance between production of biogas and prevention of uncontrolled methane emissions.

Recommendation 7

We support the industry's request for a PAS 100 Standard for digestate resulting from Anaerobic Digestion and recommend that the Government considers, seriously and urgently, options for progressing this.

Recommendation 8

We recommend that the Government carries out an economic and environmental assessment of the potential of AD biogas as an alternative (renewable) fuel to displace diesel.

Recommendation 9

The Government should act with urgency to remove the overly bureaucratic arrangements which are applied to co-firing. Specifically, OFGEM should:

- develop simple monitoring arrangements to facilitate off-site blending;
- introduce sampling arrangements which are appropriate, proportionate and fit good business practice; and,
- replace the end-of-month sampling and reconciliation procedures, taking account of relevant commercial practice with end-of-year reconciliations alone.

Recommendation 10

The Secretaries of State for Trade and Industry and Environment, Food and Rural Affairs should take overall responsibility for the Government's commitment to act on the recommendations of the Biomass Task Force and should appoint Ministers in their Departments to lead jointly the detailed implementation. Within 6 months of publication of this report an implementation plan to take forward Task Force recommendations should be delivered to Government through the Sustainable Energy Policy Network and published.

Recommendation 11

Government should establish the Carbon Trust as the national focus of knowledge and analysis on biomass energy for dissemination by the RDAs.

Recommendation 12

Government should ask the Energy Saving Trust, in addition to its existing work on small-scale renewables, to take a role in providing information to address the current lack of knowledge and awareness of biomass energy.

Recommendation 13

To help the development of biomass energy, Regional Development Agencies should, with regional partners and by June 2006, set targets for delivery of carbon savings in their region, for which biomass will form an important part. RDAs should consider delivery through a limited company based on the model developed by EEDA and SWRDA and must embrace all renewables groups in the regions and maximise use of public funds by minimising duplication.

Recommendation 14

Carbon Trust and the Energy Saving Trust should provide annual reports on progress and work closely with

the RDAs as the regional delivery partners. By April 2006 they should set out for stakeholders their respective roles and if gaps are identified explain how they will be filled.

Recommendation 15

The Ministers given responsibility for biomass energy should, in the response to this report, detail the percentage of energy supply the Government expects will be developed from biomass by 2010 and 2020 and detail the proportion that should come from the public and from the private sectors.

Recommendation 16

The Government must include the use of biomass and other renewables in policies on sustainable buildings and in the remit of the Code for Sustainable Buildings.

Recommendation 17

The Government should aim to deliver higher standards of sustainability through maximising environmental benefits with a programme of positive preference which requires all new build and refurbishment in the public estate to consider fully the use of biomass. This recommendation links to the use of biomass heating in schools and the potential to raise awareness.

Recommendation 18

The Government Office in each region, together with the RDA and Regional Assembly should, in partnership with other Government bodies, jointly commission a survey of all the government buildings within their region and their respective heating systems. The survey should provide details of the heating boiler type, fuel requirement, age and timing of replacement for each of the buildings. It should also identify those boilers which are eligible for replacement by renewables and, in the context of this study, by biomass in particular. A programme for these conversions should be produced and executed.

Recommendation 19

Each Department, RDA, GO and local authority should, within 6 months of this report, set and publish ambitious carbon targets for 2010 and 2020 for the use of renewable heat, electricity and CHP in its buildings with the direct use of renewable energy being preferred to the indirect use of renewable energy by way of contracts with electricity suppliers. Targets should include schools, hospitals and other buildings in public ownership.

Recommendation 20

Local authorities should review local development plans, regional strategies and policies and incorporate positive sustainability measures. In particular, they should comply with paragraph 8 of Planning Policy Statement 22 (PPS22) and set a target for a percentage of on-site renewable energy development to be used in new residential, commercial or industrial development. Government scrutiny of emerging development plans will provide an opportunity to ensure that the guidance in PPS22 is being followed.

Recommendation 21

The Government should encourage local authorities to use planning obligations to implement local planning policies on establishing district heating systems, based on biomass and other renewables, which are underdeveloped in the UK and have potential particularly in new build.

Recommendation 22

Building Regulations, Part J does not recognise that biomass systems are not radiant heat devices. The regulations require unnecessary measures – extending flues, fitting heat pads for heaters to stand on. Building regulations should be updated to take full account of the specifications of biomass systems.

Recommendation 23

The Clean Air Act requires approval for heat boilers used in smoke free zones. Each model has to be tested, which is expensive and can take several months, for exemption under the Act even though the European standards which appliances have passed are said to be more stringent than the Act. Government should review this requirement and develop a simplified approvals system for boilers and the fuels they burn which removes the need for individual testing of boilers.

Recommendation 24

Part L of the Building Regulations on conservation of fuel and power deals with boiler technologies. Biomass systems are included with solid fuels installations but it is essential that the guide to heating systems, which is being produced by Heating Equipment Testing and Approvals Scheme (HETAS), must deal with biomass heating systems in detail. We recommend the Government ensure that the biomass industry is represented on the working party producing the guide.

Recommendation 25

The Task Force recommends that technical, economic and best practice information be brought together by June 2006 and made available and sent to key stakeholders. The Carbon Trust, Energy Saving Trust, RDAs and Regional Assemblies should include biomass energy awareness raising amongst current publicity and promotional work. The development of biomass heating in schools should be used as an opportunity. Awareness raising should include information on the potential of biomass from waste.

Recommendation 26

Trade associations and representative bodies should take opportunities to promote the work of the Carbon Trust and the Energy Saving Trust and signpost the information which is available from those organisations on biomass.

Recommendation 27

The Government should consider the development of a logo for biomass heating boilers to signify the link with the environmental benefit being delivered.

Recommendation 28

To facilitate rapid initial development of supply chains we recommend a second round of the Bio-energy Infrastructure Scheme be run with grant funding of £3.5m.

Recommendation 29

Each RDA should analyse the infrastructure needs in its region and seek to facilitate supply chain development. Each RDA should submit, to the Ministers given responsibility for biomass energy, a plan on how they intend to do this by October 2006.

Recommendation 30

As a first step the Forestry Commission should urgently undertake and publish a full assessment of, and set out a strategic plan for, the development and use of short rotation forestry, forestry waste, farm and other woodlands, local authority trees and commercial forestry. This should be delivered by September 2006.

Recommendation 31

The Government should then consider the development of an integrated plan to optimise the use of the full range of biomass feedstocks including wastes.

Recommendation 32

The Energy Crops Scheme should continue in the next Rural Development Programme for England and should include planting grants and producer group support in order to build on the investment which has already taken place and to ensure the widest possible access to a range of feedstocks.

Recommendation 33

The Entry Level Scheme should be amended to recognise the biodiversity and other environmental benefits of energy crops.

Recommendation 34

The Task Force recommends that in taking forward the EU Biomass Action Plan the UK engages in a review of current regulations and discusses with the European Commission the range of feedstocks – crops, waste, forestry – and the changes needed to existing legislation to facilitate the use of those feedstocks as energy sources, as well as the need for the proper co-ordination between the various Directorates of the EU with a nominated Directorate to assume lead role.

Recommendation 35

The Task Force supports the Government's efforts, in the review of the RO, to find a simple and straightforward way to help facilitate the development of smaller-scale generation. The Task Force recommends that the Government take forward the RO review proposals that agents be allowed to act on behalf of small generators and to amalgamate the output of small generators and that the requirement for sale and buy-back agreements be removed.

Recommendation 36

The Task Force recommends that the European standards which are being developed – CEN TC 335 and 343 - are adopted as the basis for the UK standard for these fuels.

Recommendation 37

It is important that the detail of these standards are disseminated as fully as possible and this needs to be incorporated into the activities we identify in paragraphs 6.1 – 6.3 dealing with awareness raising.

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Recommendation 41

In the energy crops sector the performance of new varieties is crucial to delivering economic viability. Defra should make proposals for the development of arrangements which will ensure such performance data are readily available and published and that the government funded variety development work is taken forward by industry.

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The Task Force recommends that DTI asks the Skills for Business Network to arrange for the relevant Sector Skills Councils to identify the skills and training needed for the entire biomass sector from production to the final delivery of the energy. This should lead to the preparation of a sector skills agreement which will fully define the need and set out how training and skills development will be delivered.

Section 3
Appendices

Appendix A

Terms of reference and membership

Aim

To assist Government and the biomass industry in optimising the contribution of biomass energy to renewable energy targets and to sustainable farming and forestry and rural economy objectives.

Method

Identify possible measures to stimulate the development of biomass energy. Analyse the financial and broader economic costs and benefits of each recommendation.

Work with the energy, agricultural and forestry industries, potential users of biomass and other stakeholders to identify barriers in the supply chain and ways of overcoming them; this work includes direct encouragement and facilitation of co-operation within the supply chain and in Government and with relevant bodies such as RDAs.

Make recommendations to industry and public bodies.

Notes:

(1) the barriers in question are the current frailty of the supply chain, technical factors, planning restrictions and environmental factors relating to land use.

(2) the primary focus of the Study is on biomass (energy crops, forestry, agricultural plant and animal wastes) for heat and electricity generation. Biofuels for transport and other non food uses of crops may be considered in so far as cross-cutting issues arise.

(3) international comparisons should be included; this is likely to require some direct contact with other countries.

(4) the study should take account *inter alia* of the RCEP report on biomass and the Government response, and assist Government in taking forward further analyses and actions established by that response (expected to be available by September 2004). The study should involve contact with the National Non-Food Crops Centre, but take into account the limited role which the NNFCC currently has in the bioenergy field. The study should also take account of any emerging findings from the biomass workstream of the Sustainable Energy Policy Network.

(5) The study should not make recommendations on tax issues.

Reporting

The Study is commissioned by Government as a whole. The study team has open access to all relevant Departments and No 10 Downing Street.

The Secretariat of the Study will be located in Defra but drawing on expertise in other Departments and public and private bodies.

The work will report to Government via the Sustainable Energy Policy Network chaired by the Secretaries of State for Trade and Industry and for Environment, Food & Rural Affairs.

Structure of Study Team/Task Force

Sir Ben Gill (leader of study)
John Roberts CBE, Chief Executive United Utilities - energy industry representative
Nick Hartley, Oxera Consulting, Economist.

Secretariat

The Secretariat for the Task Force is based at Central Science Laboratory in York. David Clayton is Secretary to the Task Force, supported by Rebecca Cowburn and Nikki MacLeod.

Appendix B: SUMMARY OF GRANT SCHEMES FOR BIOMASS CROPS AND BIO-ENERGY CONVERSION SYSTEMS – SEPTEMBER 2005

Grant Scheme	Programme description	Total value of scheme	Money taken up to-date	Projects in place	Comments
Woodland Grant Scheme (WGS)	For managing existing woodland and planting new woodland. Scheme now closed.	£139m over 7 years to 2006	Management: £ 46.248m; New planting: £43.956m (from 01/01/02 – 31/03/05)	Management: 224,037 ha; New planting: 25,952 ha; (Total: 249,989 ha in 11,634 applications.)	Scheme has been succeeded by English Woodland Grant Scheme. www.forestry.gov.uk
Energy Crops Scheme	To support the establishment of energy crops. Support includes: - establishment grants - set-up & operating costs for SRC willow producer groups	£17.9m over 6 years	Establishment grants: £1.3 million Producer groups: £545,000	157 establishment grants: - 668ha of Miscanthus - 660 ha of SRC 3 Projects initiated under Producer Groups	Establishment grants: - Miscanthus @ £920/ha - SRC @ £1000 - £1600/ha on arable/ex-livestock land - Producer group grant aid rates at 50% of the total eligible one-off start-up costs. www.defra.gov.uk/erdp/schemes
Farm Woodland Scheme (FWS)	Trial scheme preceding FWPS (from 1988 – 1992). Long-term agreements in place.	£2m in 2004-05	N/A	approx 9,400 ha.	Succeeded by Farm Woodland Premium Scheme. www.defra.gov.uk/erdp/schemes
Farm Woodland Premium Scheme (FWPS)	Part of England Rural Development Programme (ERDP), only available in conjunction with WGS. Annual payment compensates farmers for agricultural income foregone. Scheme closed.	£77m over 7 years to 2006 (spend of £8.5m in 2004-05).	£42.584m between 2000-01 and 2004-05 (this includes expenditure on ongoing FWS commitments)	43,068 ha approved for planting between start of scheme in 1992 to end 2004-05	Scheme has been succeeded by English Woodland Grant Scheme. www.defra.gov.uk/erdp/schemes
English Woodland Grant Scheme	Funds stewardship of existing woodland and creation of new woodland where there is public benefit, particularly in terms of improved biodiversity or public access.	Balance of uncommitted funds from WGS (c. £10 m for new applications from 01/04/06)	Funding for new applications from 01.04.06.	Funding for new applications from 01.04.06.	Scheme open to applications from July 2005. Forestry Commissioned managed programme which succeeds WGS and FWPS. www.forestry.gov.uk
Bio-Energy Infrastructure Scheme	To help develop supply chain & market infrastructure for wood fuel (forestry materials & energy crops) and straw for energy.	£3.5m	£3.5m allocated	Projects address supply chain issues and include CHP, heat only, gasification and other technologies. www.defra.gov.uk/farm/acu/energy	
Clear Skies	Supports installation of renewable technologies, including biomass heat.	£12.5m for 2003-2006	c. £8.2 m allocated	59 domestic wood-fuelled projects, with funding of: £53,850. (c.2% of total domestic spend.) 61 Community projects using biomass, with funding of: £1,347,550. (c. 25% of total community spend.)	Funding of domestic projects includes 25 wood-fuelled boilers & 34 wood-fuelled stoves. Further programme information at www.clear-skies.org
The Community Energy Programme	Supports public sector district heating schemes through capital grants.	£60m (includes £10m extension to the programme, covering the years 05/06-07/08)	£50m allocated, of which £5.45m on biomass	12 grants for biomass out of 75 grants approved. (16%)	Biomass is of growing interest and importance to this sector www.defra.gov.uk/environment/energy
Community Renewables Initiative	Countryside Agency, Forestry Commission and DTI-funded; provides information & facilitation for community-based partnerships to promote small-scale renewable energy.	c. £2m (c.£500k per year for 2002-2006)	c.£1.5m	89 fully completed projects; 256 advanced projects, 3000 phone calls or emails.	he scheme covers most counties of England. 'Small-scale' is not defined to avoid being overly prescriptive. www.countryside.gov.uk/NewEnterprise/Economies

Grant Scheme	Programme description	Total value of scheme	Money taken up to-date	Projects in place	Comments
Bio-Energy Capital Grants Scheme	Introduced to develop markets for biomass in heat, CHP and power generation. Also, demonstration projects focused on new, high efficiency technologies.	£66m	£54.6 m	£4.2m for biomass heating boilers; £22m for small-medium sized biomass power plants; £28m for large-scale electricity projects.	www.dti.gov.uk/renewables
Carbon Trust RD & D Programme	A research, development and demonstration programme for low carbon projects. Projects apply through a competitive Open Call.	Figure not available	£460 k on biomass to-date.	6 of the 30 projects funded to-date relate to biomass.	The scheme supports the further development of existing technologies which offer low carbon benefits. www.thecarbontrust.co.uk/carbontrust
CAP (EU Common Agricultural Policy)	Energy crops may be grown on set-aside land or non set-aside land.	€45/ha on non-set-aside land		1,822 ha of energy crops grown on set-aside in 2003	Energy crops grown include short rotation coppice and miscanthus. www.defra.gov.uk/farm/ag2000.htm
Renewables Obligation Certificate (ROCs)	The Renewables Obligation requires licensed electricity suppliers to source specified percentages of the electricity they supply from renewable sources. The percentage target is set to increase each year from 4.9 per cent in 2004/05 to reach 10.4 per cent by 2010/11. For each megawatt hour of renewable energy generated, a tradable certificate, called a Renewables Obligation	Buy-out price for 2005-06 obligation period is: £32.33 / MWh.		Eligible electricity includes biomass & electricity component of biomass CHP. Ends: 2016. The Ofgem Report for 2004 (figure 11) records that biomass accounts for 16% of ROCs and SROCs issued, while co-firing accounts for 14%. www.ofgem.gov.uk www.dti.gov.uk/renewables	
Emissions Trading Schemes(UK & EU ETS)	Companies are set annual targets for greenhouse gas emissions. They may meet these targets either through energy efficiency or low carbon solutions, or by buying in (i.e. trading) 'allowances', from other companies.	Current scheme trading prices: UK ETS = c. £2.50 - £3.00/t carbon dioxide (at 07/10/05) EU ETS = € 23.65/t carbon dioxide (at 07/10/05)		The UK ETS has 32 direct participants; holders of Climate Change Agreements can also trade within the scheme. The EU ETS scheme has been in operation since January 2005. www.defra.gov.uk/emvironment/climatechange	
Climate Change Agreements (CCA)	CCAs are between Government (Defra) and businesses. The businesses commit to challenging energy efficiency or carbon savings targets, in order to reduce net energy consumption and carbon dioxide (CO2) emissions and be eligible for Levy Exemption Certificates.			At present c. 10,000 facilities within 42 business sectors have agreements (i.e. are 'certified'). The main drivers for businesses to engage in Climate Change Agreements are: 1) a reduction (of up to 80%) in the Climate Change Levy if targets are met, and 2) a resulting saving in energy costs as energy use is reduced.	
Levy Exemption Certificates (LECs)	LECs exempt businesses from being subject to a proportion of the Climate Change Levy* in those cases where the business has entered into a Climate Change Agreement with the Government.	Levy Exemption Certificates can reduce the Climate Change Levy by up to 80%.		*The Climate Change Levy is an energy tax applied to UK businesses to encourage a reduction in energy use. It adds approximately 15% to a business's typical energy costs.	
DTI Technology Programme	Programme available to businesses as grants via DTI business support products: 'Collaborative Research & Development' and 'Knowledge Transfer Network'.	£320 million over 2005-2008	One Open Competition to-date (April 2005) of c. £100m	17 projects in 'New and Renewable Energy Technologies' with £9m funding.	www.dti.gov.uk

Appendix C
Barriers to development

During the study the Task Force sought to engage with the industry by posting questions on its webpage, meetings, visits and the progress commentaries and other reports. Industry has risen to this challenge and provided a large volume of comment and input. The Task Force records here comments which have been made to us during the fact-finding phase of our work:

(a) Whitehall policy and delivery

- Lack of joining-up in Government/Regulator – Defra, DTI, Ofgem all have different agendas and policy objectives.
- Renewables targets led to an emphasis on electricity but excluded heat. Electricity is the sector which struggles most with viability.
- No clear vision or strategy to develop and deliver biomass. Lack of clarity about what Government wants for future – large-scale, small-scale, embedded generation, heat, CHP, micro generation, period of commitment to ROC system?
- History of stop/start initiatives, for example, Community Renewables Initiative and Clear Skies. Long-term strategy needed.
- Complex and fragmented grant aid and support structure, short application deadlines, academic appraisal panels, rates vary between schemes.
- Grant schemes can distort rather then develop markets – eg Bio-energy Capital Grant Scheme prevents use of heat for some large projects.
- No link between grants and value of carbon saved.
- Public procurement policy has potential to develop the use of renewables, including biomass, by establishing exemplars but this potential has not been exploited.
- Ofgem over-police and no access to an appeals mechanism.
- Challenge, within role of Ofgem, of balancing short-term consumer interests and environmental agenda.
- Cost of system connections for small, renewable generators.
- Conflict between Treasury Green Book, which requires local authorities to take account of environmental benefits and disbenefits over 20 years, and PFI which looks at up-front capital cost.

(b) Regulation

- Planning – the impact of public perception on planning applications.
- Planning policy - no specific drivers to develop district heating.
- Planning gain potential has not been maximised. PPS22 helpful but local authorities see a danger if they are too prescriptive with developers – could lose appeals and have to bear costs
- PPS22 helpful but still lack of support through planning system.
- Inappropriate application to biomass of Clean Air Act and building regulations relevant to coal-fired heating systems,
- VAT levied on gas (5%) compared to biomass boilers (17.5%).

(c) Renewables Obligation Certificates

- Complexity of Renewable Obligation system.

- Renewable Obligation 98% purity level for biomass set too high.
- Off-site blending rules for co-firing can hamper commercial options.
- Lack of access to ROCs for small generators.

(d) Heat market

- Heat is currently the most viable biomass option in market but has so far been ignored.
- Heat Obligation run as the current Renewables Obligation could be complex and bureaucratic – could use targets and an implementation plan as an alternative.
- Value of heat energy and linked carbon saving not recognised.
- Higher cost of capital equipment compared to gas and oil means that capital support is needed.

(e) Biomass CHP

- Requirement to predict electricity supply into Grid is a barrier for CHP projects which are designed to produce heat and spill surplus energy.
- Biomass CHP capital equipment currently expensive although costs likely to fall as the industry develops.

(f) Viability of biomass electricity in market

- Viability – biomass fuel has a price/cost which has been too high to make projects viable without support. Emphasis on energy crops distorts project economics. Not clear there will be an economic return to grower/forester.
- Absence of PPAs for adequate periods means revenue or other support is needed to achieve viability for biomass.

(g) Technology

- Emphasis on development of biomass based on new technology failed – but existing technology proven and bankable.
- Absence of type approval for some biomass energy capital equipment.

(h) Developing supply chains

- Needs market to pull through supply chain. Important to involve agriculture, forestry and waste (recycling) sectors. Funding needed to follow-on from Bio-energy Infrastructure Scheme – long-term investment and clear regional strategies needed.
- Energy crops – knowledge base poor, expensive to establish, costs not fully proven, long-term commitment needed but market insecure, legislation subject to frequent revision, possible SRC impacts on land value.
- Feedstocks – wrong to interfere, for example by supporting energy crops. Better to let the market decide on the feedstocks.
- Alternative energy crops – little government support for short rotation forestry as an alternative.
- Woodland resource could be sustainably managed to provide feedstocks but economics do not always evidence viability.
- Lack of accreditation system for biomass – quality standards and technical specification.
- Pellets could provide feedstock for domestic uses but is an energy cost for their production.
- Lack of mechanisms to develop co-operatives in the supply chain.

(i) Waste biomass

- Significant potential to reduce landfill which is not being tapped.
- Waste legislation, interpretation and waste hierarchy (emphasis on recycling) have inhibited the development of waste to energy.
- Conflict between composting targets and use of arboricultural material for energy.

(j) Education and training

- Information papers, exemplars, working examples are lacking.
- Lack of awareness and education - biomass projects can be seen as high risk, builders, architects, engineers and quantity surveyors less aware of options, codes of practice and training based on large gas systems.
- Lack of promotion and publicity through use of exemplars.
- Lack of public awareness of the facts about biomass energy.
- Lack of skilled engineers to install and maintain systems.

(k) Regional delivery

- No clear regional strategy for implementation.
- Too many players, including RDAs, LAs, GOs.
- Lack of carbon targets for RDAs means there is no driver.
- Regional effort fragmented – but need regional strategies to implement national targets and priorities. Who should lead? Local Authorities have expertise which is not being tapped.
- Switching of RDA priorities can lead to a loss of funding for developers.

(l) Sustainable development

- Can be impacts on biodiversity – best practice guidance needed.
- Sustainability must be demonstrated and maintained – especially for imported wood and wood products.
- Lack of life cycle assessment standards.
- Has been some degree of mismatch between scale of projects and location.
- Sustainability impacts not always clear – water uptake, run-off, nutrient uptake, soil erosion. Unclear how imported biomass scores against sustainability issue.

(m) Financial issues

- Small projects find it difficult to raise finance.
- Financing new technologies is difficult.
- Lack of type approval means that due diligence is expensive for lenders.
- Lenders can be risk averse.

(n) Other

- Some ineffective trade associations.
- Lack of SRC varieties with adequate genetic base.
- Development of biomass energy could force prices to rise with an adverse impact on the wood panel industry.
- Research effort lacks cohesion.

Appendix D
Biomass potential: data

Table 1

Quantification of existing[26] biomass resource and its potential for energy generation

Biomass source	Available tonnage (dry tonnes)	Energy contained in biomass (TJ)	Potential energy generation		
			Electricity only	Heat only	Heat & Electricity
Energy conversion efficiency (1)		(11)	**30%** **GWh_e**	**85%** **GWh_h**	**85%** **$GWh_{e\&h}$**
A) 'Dry' materials					
Forestry waste and arboricultural arisings	1,460,000 (4)	21,900-25,988	1,825-2,166	5,171-6,136	5,171-6,136
Waste wood (industrial)	3,000,000 (5)	35,700	2,975	8,429	8,429
Energy Crops (short rotation coppice (willow/ poplar) and miscanthus)	250,000-366,750 (6)	3,940-6,671	328-556	930-1,362	930- 1,362
Cereal straw	3,000,000 (7)	40,500-49,500	3,375-4,125	9,563-11,688	9,563-11,688
Municipal solid waste	7,600,500 (8)	60,804-76,005	5,067-6,334	14,357-17,946	14,357-17,946
Sewage sludge	384,222 (9)	5,802-7,684	483-640	1,370-1,814	1,370-1,814
Poultry manure - Meat birds (60% DM)	1,158,300 (10)	16,216	1,351	3,829	3,829
Sub-total:	16,853,022 – 16,969,722	184,862 – 217,764	15,404 – 18,147	43,649 – 51,204	43,649 – 51,204
B) 'Wet' materials (Anaerobic Digestion)					
Typical AD conversion efficiency rates (2):		See note 3	**40%**	**85%**	**80%**
Poultry manure – egg laying flock (30% DM)	356,700 (10)	2,461-4,815	270-540	580-1,140	550-1070
Dairy cattle slurry (10% DM)	2,016,000 (10)	11,592-12,600	1,290-1,400	2,740-2980	2,580-2800
Pig manures (10% DM)	535,500	2,923-3,480	320-390	690-820	650-770
Sub-total:	2,907,200	16,976-20,895	1,880-2,330	4,010-4,940	3,780-4,640
Total:	19,760,222-19,876,972	201,838-238,659	17,284-20,477	47,659-56,144	47,429-55,844

Data supplied by D.Turley, Central Science Laboratory

[26] covers not only the currently used resource but also the existing resource which has yet to be exploited.

1) *Wood for energy production, CHP and power plants. Danish Centre for biomass technology* (www.videncenter.dk/uk/index.htm) This report presents data on current CHP efficiencies of electricity generation, heat only generation as well as CHP generation, with real data from several CHP plants in Denmark - figures for CHP and energy and heat split for CHP represent average values across a range of installations. Generation of heat alone should reach 85% conversion efficiency (district heating plant). Conversion efficiency of 30% assumed for electricity generation for UK steam turbine mass burn technology.

2) Efficiency figures assumes more efficient spark ignition engine used for electricity generation (40% efficient) rather than Rankin cycle process (30% efficient). Size of typical AD plant not really suited to heat generation, but at least 80% energy conversion should be achieved in any CHP set-up (50:50 electric and heat (Environment Agency)). For heat only situation assumed 85% efficiency figure based on 'heat only' case (from: *Wood for energy production, Chapter 9, CHP and Power Plants. Danish Centre for Biomass Technology* (www.videncentre.dk/uk/index)).

3) Energy from anaerobic digestion based on estimation of biogas production – figures used are based on current inefficient AD technologies and could theoretically increase (typically threefold) with appropriate technical development. With such development the gap between technologies would close. However, AD remains the only feasible route to economically exploit wastes at 30% DM or less *(Don Ridley, Environment Agency)*.

4) Derived from: *Wood fuel resource in Britain, Forestry Commission (Forestry and Arboricultural arisings - taking account of other competing outlets, 2003-06 to 2017-21).* NB: These are GB, not UK, figures.

5) *Tom Fourcade, WRAP, pers comm* - 5-7 million tonnes (Mt) of wood waste produced annually, of which 1.4 Mt recovered in 2004. Of the 1.4Mt recovered, 1.22 Mt was recycled and the remaining 0.18 Mt, although potentially suitable for energy recovery, was sent to landfill. Anticipate recycling of best wood to increase to 3 Mt/a, leaving 3 Mt/a of lower quality and contaminated wood for energy markets.

6) Represents forecasted area for plantings within the next 4 years, based on virgin biomass-fuelled projects that are coming forward. This amounts to a total of c. 25,000 ha for SRC and Miscanthus combined. A breakdown of returns suggests that one third of this will be met from Miscanthus and the rest from SRC.

   Yield ranges used: SRC crops over 3 years old (i.e. well established) should yield up to 10.9 oven dried tonnes (odt) per annum *(Agricultural Budgeting and Costings Book (Agro business Consultants Ltd, May 2004)*, and in the best cases up to 15t/ha (upper end of Rothamsted results *(From work carried out by Black & Veatch for The Carbon Trust))*. The range of 10-15 odt/ha used in this analysis agrees with yield ranges presented in a review of Long Ashton's long-term trials work with willow clones and spacing trials *(Willow Biomass as a Source of Fuel, Institute of Arable Crops Research. Long Ashton Research Station (now defunct) 10 pages (LARS 86/4, 1989)).*

   Miscanthus crops over 3 years old (i.e. well established) should yield between 10 and 14 odt/annum *(Nix Farm Management Pocket Book & Bical).* These Miscanthus yield figures are relatively conservative as under trial conditions, average yields of up to 18 t/ha have been achieved (MAFF funded work – *Project NF0403 Miscanthus Agronomy final project report).* However, 10-14 odt was taken as the likely Miscanthus yield range given that perennial energy crops may not always be placed on the best soil types.

   Calorific values used: A calorific value of 17.3 MJ/kg (dry weight basis) was used for Miscanthus, based on published analysis results (2003) by Energy Power Resources Ltd in work for the DTI *(Miscanthus – Practical Aspects of Biofuel Development (Report for the DTI on work carried out under the DTI's New and renewable Energy Programme)).*

   The calorific value of short rotation coppice (typically represented by Willow) is typically taken to be similar to

that of deciduous wood in most analysis of energy potential (i.e. 17.9MJ/kg (dry)). However, calorific values as low as 15 MJ/kg (*Renewables East* (www.renewableseast.org.uk)) and as high as 18.6 MJ/kg (dry basis) *(DTI estimated average gross calorific values for fuels 2003* (www.dti.gov.uk)) have been quoted. In this analysis a range from 15 to 18.6 MJ/kg dry weight was used.

7) The UK cereal straw resource is significant (9-10mt per annum) but much of this is recycled to livestock and much of the rest is ploughed into soil (it has a resource value as a fertiliser and organic matter supplement) - However in Eastern counties of England a surplus is available. It is estimated that up to 3m tonne could be made available in the long term without disrupting livestock use/buying costs *(Agricultural waste mass balance: opportunities for recycling and producing energy from waste technologies (Biffa/C-Tech Innovation/FEC)*). This takes no account of alternative markets which could develop for straw in the future, which are difficult to predict at this point in time. Currently only around 200,000 t/annum is burnt for energy.

8) *Future Perfect - Analysis of Britain's waste production and disposal account, with implications for industry and government for the next twenty years (Biffa)* indicates that Municipal Solid Waste currently amounts to 28.1 million tonnes per annum in total and 24.7 mta after recycling. Currently 9% of this is incinerated (2.5 m tonnes), but Local Authorities plan up to 27% of this going to incineration by 2020 (7.6 m tonnes). This tallies with forward estimates by the environment agency that by 2010 the amount of waste that will need to be incinerated or recovered will reach 10 million tonnes (http://www.environment-agency.gov.uk/yourenv/eff/resources_waste/213982/203410/?version=1&lang=_e)

9) 1,130,066 odt sewage sludge produced in UK per annum - 55% spread on land, 25% currently incinerated, 9% landfill and 12% other (land reclamation etc) *(Defra: waste on line)*: assumption that 34% available for incineration (25% currently being incinerated plus 9% currently landfilled).

10) Calculated from Defra statistics and data presented in *Managing Livestock Manures - making better use of livestock manures on grassland, Defra publication (ADAS/IGER/SRI).* Clearly this represents a theoretical maximum for each manure type as most will still be recycled to land. The greatest opportunity to exploit such resources will be in areas of high stock density where there are limits on the ability to spread to land, due to environmental or logistical constraints.

11) All figures account for moisture content of parent biomass material.

12) Note that the ability to exploit 'waste' resources such as MSW and sewage sludge, and potentially other manure wastes, through direct combustion is limited by impacts on flue emissions and the application of the Waste Incineration Directive that currently constrains greater use of such resources by adding to the costs of clean up. Anaerobic digestion offers a cleaner alternative route to exploitation of such materials for energy generation.

Table 2

Potential Carbon savings arising from substitution of grid electricity and heating oil - for energy generation based on existing biomass resources and energy conversion efficiencies (based on data presented in Table 1) (see note 1)

Biomass source	Potential Carbon savings (million tonnes C)		
	Electricity only	Heat only	Heat & Electricity
'Dry' materials			
Forestry waste and arboricultural arisings	0.21-0.25	0.52-0.62	0.55-0.65
Waste wood (industrial)	0.35	0.85	0.89
Energy Crops (short rotation coppice (willow/poplar) and miscanthus)	0.04-0.07	0.09-0.16	0.10-0.17
Cereal straw	0.40-0.48	0.96-1.18	1.01-1.24
Municipal solid waste	0.09-0.11	0.02-0.03	0.09-0.12
Sewage sludge (dry solids)	0.06-0.08	0.14-0.18	0.14-0.18
Poultry manure - Meat birds (60% DM)	0.16	0.39	0.40
Sub-total:	1.30-1.49	2.98-3.41	3.18-3.64
'Wet' materials			
Poultry manure – egg laying flock (30% DM)	0.03-0.06	0.05-0.11	0.05-0.11
Dairy cattle slurry (10% DM)	0.15-0.16	0.28-0.30	0.28-0.30
Pig manures (10% DM)	0.04-0.05	0.07-0.08	0.07-0.08
Sub-total:	0.23-0.27	0.40-0.49	0.40-0.49
Total:	1.52-1.76	3.38-3.90	3.58-4.13

Data supplied by D. Turley, Central Science Laboratory

1) Carbon emission factors of 420 t CO2/GWh used for for grid electricity (DTI) and 370 t CO2/GWh (heat) for heating oil (Elsayed et al, 2003). MSW has an emission factor of 364 t CO2/GWh (note 2). For all other biomass resources no net emission assumed.

2) The carbon content of MSW is typically about 30% by weight, so consequently burning 1 tonne of MSW will release 1.1t of carbon dioxide. The composition of MSW varies widely from region to region, but typically is composed of 20-38% food/garden waste, 16-27% paper/board, 9-10% plastic, 5-9% glass, 4-5% metals, 2-3% textiles, 3.5-10% misc combustibles, 2-13% misc non-combustibles (*Thermal methods of municipal waste treatment (Biffa/C-Tech Innovation)*). Increased sorting to reduce plastic and other non-renewable components would reduce the emission factor.

Appendix E
Summary of earlier reports

First progress commentary – 14 February 2005

1. The first progress commentary highlighted:

- The lack of and need for an effective supply chain.
- The conversion efficiency and potential of biomass heat.
- A lack of long-term, clear messages about what needs to be delivered.
- Complexity and bureaucracy in delivery arrangements.

Second progress commentary – 30 March 2005

2. This document reviewed the responses from stakeholders which highlighted the lack of viability for biomass electricity and noted that demand for biomass electricity, heat and CHP must pull through the supply chain. The potential for waste as an energy feedstock was seen as significant and this was flagged as an area for further examination by the Task Force. The Task Force had begun to draw on international comparisons which highlighted the potential to develop biomass energy through comprehensive and consistent support from Governments, the use of fossil fuel taxes, strategic planning, and appropriate use of regulation.

3. The second progress commentary also focused on:
   - The need for feedstocks to meet consistent quality standards.
   - The potential of co-firing to develop supply chains.
   - Issues about the ability of developers to finance projects.
   - Feedstock availability and potential.
   - The organisation of research and development.

Interim Report – 14 June 2005

4. The Interim report set out the assumptions the Task Force were basing their future vision for biomass on. Key conclusions were that, alongside the other significant feedstocks such as waste, around 1 million hectares of land would be available for the cultivation of non-food crops and that EU biofuels objectives would lead to competition for land. Future development was likely in the cultivation of crops as a raw material source for industry. Primary, secondary and possible tertiary use would be followed by use as an energy source.

5. The report noted the support which had been made available for biomass, the limited progress and the changing context of rising energy prices. In assessing the case for biomass the benefits beyond carbon saving were set out, as were the outline data on feedstock potential. The barriers which industry had reported to the Task Force were set out in the report.

6. The interim report posed a series of questions about how a policy to develop biomass energy should be delivered nationally and regionally. It assessed the potential of support for biomass electricity and heat systems, looking at options to support the latter including a renewable heat obligation, voluntary agreements with industry and capital grants. Public procurement was seen as a key way to drive forward biomass energy and to pull through supply chains. The potential to develop energy from waste, use of the planning system and

quality standards were discussed. Finally, the interim report commented on the changes needed to support co-firing of biomass and other issues raised by the DTI consultation on the Renewables Obligation.

Emerging conclusions and draft recommendations – 3 August 2005

7. The emerging conclusions and draft recommendations report analysed the nature of the barriers to the development of biomass and the theoretical potential of the range of feedstocks. It looked at how other countries have taken forward biomass energy or struggled to make progress. The key elements of the vision for biomass were rehearsed.

8. The main part of the report set out emerging conclusions and draft recommendations. These form the basis of this final report and so the detail is not recorded here.

Appendix F
Detail on international visits

1. During this study the Task Force undertook desk research on international comparisons and Sir Ben Gill and David Clayton visited Finland, Canada and Sweden.

2. Finland has an Action Plan for Renewable Energy which launched in 1999 and includes:
   - Doubling renewable energy by 2050.
   - Taxation of fossil fuels.
   - By 2010, renewables to account for 30% of consumption.
   - 31m support for renewables and energy conservation in 2003.

3. The development of woodchip is given priority and use was quadrupled from 1999-2003.
   Key issues are seen as:
   - Reliable supply needed (quantity, quality, price).
   - Integration with other supplies of woodfuel essential.
   - Production logistics need to be developed.
   - Supply chain framework needs to be developed by wood procurement organisations.
   - Chipping is moving from the forest to woodfuel plants.
   - Technology development needs to integrate manufacturers, producer groups, contractors and researchers.

4. Canada has more biomass potential than any other country except Russia and Brazil. Its largest practical source of biomass energy is waste from pulp and paper mills and sawmills. There are initiatives to promote the development of renewables but no specific targets. In the future, co-firing is seen as a potential way to develop supply chains and infrastructure. Low energy prices mean that biomass energy finds it difficult to compete. Canada has national climate change targets but there are no provincial targets. A significant amount of policy making is devolved to the provincial level.

5. In Sweden bioenergy is seen as an important part of the transition to a long-term and sustainable energy system. District heating is extensive and the use of wood pellets in homes is growing significantly. The production of biogas as a vehicle fuel has been adopted by twelve municipalities and is increasingly used in public transport systems. The first biogas fuelled train came into service in 2004.

6. In 2002 around 800,000 tonnes of wood pellets were used in Sweden. Since 1 May 2003 renewable electricity certificates linked to an obligation, similar to the UK system, have been used to stimulate production. The quota to be met will be increased to stimulate production and was set at 7.4% in 2003 rising to 16.9% for 2010. Alongside this, Sweden uses taxation to promote the use of bioenergy. A carbon dioxide tax, in place since 1991, has helped to make bioenergy very competitive in heat production. The carbon dioxide tax is not levied on the production of electricity. A Minister in Sweden's new Sustainable Development Department champions energy efficiency and renewable energy issues.

7. Austria has successfully used capital grants to support installation of biomass heating systems with an emphasis on local sustainability in energy infrastructure. Higher rates of grant have been available for primary producers which means revenue feeds back to those producers for added value products such as heat. The use of wood-fired domestic heating is now widespread in Austria and was significantly boosted after wood pellets were introduced in 1994. Although there is a small energy cost (3-5%) in production, pellets are said to give better combustion and handling properties and a quality label and tracking system guarantees quality. Austria has benefited from its 139 on-farm biogas pants that operate on crops such as maize, grass and manures.

8. In Denmark, rises in taxation were used to maintain prices and make biomass energy financially attractive at a time when fossil fuels costs were reducing. Linked to high feed-in tariffs, this stimulated rapid development. Long-term government commitments gave confidence to the market but the election of a "tax reducing" Government introduced uncertainty about future commitments to support. The renewable energy market declined rapidly over the last two years. Severe nutrient management legislation provided a strong impetus for the development of the biogas sector.

Appendix G
Links with other reviews, strategies and studies

1. The Task Force has sought to draw on and link with other reviews, strategies and studies running in parallel to its work.

2. The Royal Commission on Environmental Pollution completed its report Biomass as a Renewable Energy Source in 2004 and the Government response issued at about the same time as the Task Force began its work. We have discussed the report and response with the RCEP and have taken account of their recommendations.

3. The Task Force responded to the DTI's Review of the Renewables Obligation commenting on the future of waste within the RO system, co-firing and issues affecting small generators.

4. During the course of our work the Carbon Trust commissioned a study to develop a biomass acceleration programme. We have discussed common areas of interest with the Carbon Trust and its consultants and the Secretary to the Task Force took part in the peer review of the study.

5. We took account of the National Audit Office report on renewable energy published in 2005.

6. There has been considerable interest in the development of biomass heat during the Task Force's work. The RCEP recommendation that the Government introduce an obligation to force development led to the commissioning by DTI and Defra of a study to look at renewable heat and heat from combined heat and power plants.

7. We have discussed with colleagues responsible for the Climate Change Programme Review the potential to incorporate biomass heat into the Climate Change Programme.

8. Discussions have been held with and views sought from the Sustainable Development Commission. The Task Force discussed its work with the Rural Climate Change Forum, the leader of the work developing a national action plan for procurement across the public sector and highlighted the potential of biomass renewables to those developing the sustainable buildings strategy.

8. In Brussels, the Task Force met European commission officials to discuss the Biomass Action Plan and the thematic strategy on the prevention and recycling of waste. The latter is expected to lead to amendments to the Waste Framework Directive in 2008.

Appendix H
Visits and meetings

Advantage West Midlands Development Agency

AEA Technology Plc

All Party Parliamentary Group For The Wood Panel Industry

AW Jenkinson Forest Products Limited

Banks Cargill Agriculture

Barclays Renewable Energy Project

Bedzed

Bical Industrial Crops Limited

Biffa Waste Services Limited

Biojule

Black & Veatch Limited

BRE

British Biogen

British Hay and Straw Merchants Association

British Sugar Plc

Bronzeoak

Burges Salmon

Carbon Trust, The

Centre for Novel Agricultural Products – University of York

Centre for Sustainable Energy

Climate Change Capital

Combined Heat and Power Association

Compact Power Limited

Confederation of British Industry

Conservative Party - Anne McIntosh MP

Conservative Party - Rt Hon Oliver Letwin

Consulting With A Purpose

Coppice Resources Limited

Country Land & Business Association

Cred Limited

Crown Estate

DEFRA - Parliamentary Under-Secretary of state, Lord Whitty

DEFRA – Parliamentary Under-Secretary of State, Lord Bach

DEFRA Sustainable Energy Unit

DEFRA Waste

Department for Education and Skills – Schools Capital Design Team

Department of Trade and Industry

Department of Trade and Industry Minister of State, Malcolm Wicks

Department of Trade and Industry Minister of State, Mike O'Brien

Drax Power Station

Duchy College

Duchy of Cornwall

East England Development Agency

East Midlands Development Agency

Eccleshall Biomass Limited

Econergy Limited

Eden Project

Elean Power Station

Energy & Environmental Business Services Limited

Energy Power Resources

Energy Savings Trust

English Forestry Industries Partnership

English Nature

Enterprise Trade & Investment, Northern Ireland

Environment Agency

Environmental Industries Federation

E.On UK Plc

European Fat Processors and Renderers Association

Fiddlers Ferry Power Station

Forestry Commission

Forestry Enterprise

Forestry & Timber Association

Forum For The Future

Global Olivine UK Limited

Hadfield Wood Recyclers

HM Treasury

HSBC

Iogen

John Amos & Co

Liberal Democrats - Norman Baker MP

London Climate Change Agency

Lukehurst, Clare

Ministry of Defence

National Farmers Union

National Forest Company

National Non Foods Crop Centre

Northwest Development Agency

Nottingham County Council

Office of the Deputy Prime Minister

Ofgem

One NorthEast Development Agency

Paul Arwas Associates

Peninsular Power

Policy Advisers - Downing Street

Renergy Limited

Renewables East

Renewable Energy From Agriculture Limited (REFA Ltd)

Renewable Energy Growers Limited

Renewable Energy Suppliers Limited

Renewable Energy Systems Group

Renewable Power Association

Rothamsted Research

Roves Energy

Royal Commission on Environmental Pollution

Royal Institute of British Architects

RSPB

Rural Energy Limited

Rural Generation, Northern Ireland

Scottish Coal

SembCorp Utilities (UK) Limited

Shropshire County Council

Slough Heat and Power

South East England Development Agency

South West of England Development Agency

Springdale Crops Synergies Limited

Sustainable Development Commission

Sustainable Procurement Task Force

SW seed Limited

Talbotts Limited

Tate & Lyle Plc

UK Business Council for Sustainable Energy

Viney, Nigel

Warwick Business School

Waste & Resources Action Programme

Waste Technologies Limited

Wessex Grain

Windborne International

Winkleigh Society representatives

Woking Borough Council

Wood Panel Industries

Yorkshire Forward

Yorwoods

Appendix I
List of respondents to reports

ABB
Adas
Advantage West Midlands Development Agency
Agricultural & Rural Strategy Group, CSL
Bedminster International
Bical Industrial Crops Limited
Biffa Waste Services Limited
BioEnergy Group at Imperial College
BioEnergy Research Group at Aston University
Biomass Implementation Group
Bourchier, Chris
Bowman, Carol
BRE
Bronzeoak Limited
Bruce Boucher Consultancy
Buccleuch
Carbon Trust, The
Carter, Murray
Castle Cement Limited
Centre for Sustainable Energy
A.J. Charltons & Sons Limited
Coggins, Professor Chris
Combined Heat and Power Association
Confederation of Forest Industries (UK) Limited
Confederation of Paper Industries Limited
Cornwall Agricultural Council
Council for British Archaeology
Country Land and Business Association
Countryside Agency - Landscape, Access and Recreation Division
Defence Estates
Defra Waste
Defra – West Midlands New & Non Food Crop Network
Department of Agriculture and Rural Development
Department of Energy Trade and Investment
Department of Trade and Industry
Drax Power Limited
DWP Harvesting and Marketing
East of England Development Agency
East Midlands Development Agency
Eccleshall Biomass
Econergy Limited
EDF Energy Plc
Energy Crops Company, The
Energy Power Resources Limited
Energy Savings Trust
English Nature
Envirolink Northwest
Environment Agency
Environmental Services Association
E.ON UK Plc
ESD Biomass Limited
Estech Europe
Farm 2000/Teisen products Limited
FEC Services Limited
Freshney Cargo Services Limited
Friends of the Earth
Foreign Office, Brazil
Forestry Business Services (UK)
Forestry Commission
Foundation Firewood
Fuel Poverty Advisory Group
Gossop, John
Government Office for the North West
Green, Richard
Greenfinch Limited
Green Land Reclamation Limited
Green Renewable Energy Company Limited
GT Systems
Gulliver-Goodall, Gavin
Hampshire County Council - Natural Resources Branch
Hanlon, Redmond
Hefford, Jo
Herhof Environmental (UK) Limited
HGCA
Highland Wood Energy Limited
IGER
Iggesund Paperboard
Imax Capital Corporation Limited
Ineos Chlor Limited
Institute of Domestic Heating & Environmental Engineers
Institute of Grassland & Environmental Research
Johnson Matthey Catalysts
Jones, Dionne
Juggins, Stephen
KTI Energy Limited
Lantra
Lukehurst, Clare
Manco Energy Limited
Max Fordham LLP
Moralee, Peter
National Energy Foundation
National Forest Company
National Non-Food Crops Centre
National Trust
New and Renewable Energy Centre
North Energy Associates
Northern Ireland Authority for Energy Regulation
Northwest Development Agency
Northwoods
Office of the Deputy Prime Minister - planning department
Ofgem
One NorthEast Development Agency
Peninsula Power
PrimaBio
Progressive Energy Limited
Frank Raymond
Region SW
Renewables East
Renewable Energy Group
Renewable Energy Suppliers Limited
Renewable Fuels Limited
Renewable Power Association
Renew Tees Valley Limited
Richards, Gideon
Rothamsted Research
Royal Commission on Environmental Pollution
Royal Institution of Chartered Surveyors
RSPB
Rural Energy Trust Limited
Rural Generation Limited
Scottish Agricultural Organisation Society Limited
Scottish BioPower Limited
Scottish Coal
Scottish Enterprise
Scottish Forest Industries Cluster
Scottish Renewables
Scottish and Southern Energy Plc
SembCorp Utilities (UK) Limited
Severn Trent Plc
Shanks Waste Solutions
Smith, Professor Peter
Smoker, Nicola
Somerset County Council – Sustainable Development Group
South East of England Development Agency
South West of England Development Agency
South Yorkshire Forest Partnerships
Sustainable Development Commission
SW Core
SW Seed Limited
Syngenta
Talbott's
Technology Innovation Centre
Tilhill Forestry Limited
Tree of Dreams
TV Energy
Vollenbroaek, Frans
Waste & Resource Action Programme
Welsh Assembly – Department of Environment, Planning and the Countryside
Welsh Biofuels
West Midlands Woodland and Forestry Forum
Williams, Gage
Wisenergy
Wood Energy Business Scheme
Wood Energy Limited
Wood Energy Action Group
Wood Panel Industries Federation
Woodland Initiatives Network
Yorkshire Forward Development Agency

Report published by the Biomass Task Force

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