



## Biomass

Standard Note: SN/SC/6586  
Last updated: 18 March 2013  
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Section: Science and Environment

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The use of renewable fuels in energy generation is an EU policy and there is an EU wide mandatory target of 20% of all energy being generated from renewables by 2020. Biomass is seen as a key contributor to meeting these aims and is a generic term for any organic material that can be used to produce heat, electricity or transport fuel.

UK Government has set out policies to support the use of biomass in energy generation in its UK Biomass Strategy published in 2012. The Government has also consulted on proposed improvements to the biomass sustainability criteria used to determine support for biomass through the Renewables Obligation. Background information on bioenergy and sustainability can be found in the July 2012 POST Note Bioenergy.

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## 1 Summary

. The use of renewable fuels in energy generation is a policy propounded by the European Union which has established mandatory targets to be achieved by 2020 for a 20% overall share of renewable energy in the EU. Biomass is seen as a key contributor to meeting these aims and the UK Government has set out policies to support the use of biomass in energy generation in its [UK Biomass Strategy](#) published in 2012. Background information on bioenergy and sustainability can be found in the July 2012 POST Note [Bioenergy](#)

A number of technologies exist for harnessing energy from biomass in wastes such as human sewage and animal manure. The UK Government supports the use of these where appropriate, including through some financial incentives for anaerobic digestion (Renewables Obligation Certificates and the Feed-In Tariff).

The Department of Energy and Climate Change estimates that biomass could contribute 21% of the UK's target (via the EU) of generating 15% of the UK's energy from renewable sources by 2020. A recent report by Deloitte, [Knock on Wood – Is biomass the answer to 2020?](#) (November 2012) identified five key challenges that biomass developers face in reaching those levels: regulation, feedstock, sustainability, supply chain and financing. The research indicated that investment on conversion of coal-fired power stations and co-firing provide returns that are competitive with other renewable technologies. In July 2012, the Drax coal-fired power station in Yorkshire [announced](#) that it was converting to sustainable biomass with the first unit converting in April 2013.<sup>1</sup>

## 2 Background

Biomass is a generic term for any organic material that can be used to produce heat, electricity or transport fuel. The original energy source is from the sun (solar), which creates organic matter through photosynthesis. There are four basic groups of biomass material:

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<sup>1</sup> Drax, [HAbout Drax biomass plansH](#) as on 14 March 2013

- **woody energy crops** such as short rotation forestry and perennial crops like coppiced willow and miscanthus (also known as elephant grass);
- **other energy crops** such as oilseed rape, sugar beet, wheat and maize;
- **agricultural residues** such as cereal straw, manures and forest thinnings; and
- **wastes** such as landfill gas, municipal solid waste, waste wood, poultry litter, abattoir waste and waste vegetable oils.

## 2.1 Key Statistics

- In 2011 generation from dedicated biomass was 2.3 TWh or 0.6% of UK generation. Around three-quarters of this was plant biomass (including straw and short rotation energy crops) the rest was animal biomass.
- In 2011 around half the biomass used for generation was imported, all animal biomass is home produced.
- An additional 3.0 TWh of generation (0.8% of UK supply) in 2011 was from biomass co-fired with fossil fuels. More than 90% of this biomass was imported in 2011.
- Generation from dedicated plant biomass has more than doubled over the past four years.
- Wood is currently used for heating (in homes and industry) rather than electricity generation. 40% of this was waste wood. We are a net exporter of wood and wood waste for energy.
- Other smaller amounts of biomass are used for anaerobic digestion (produces methane) and to produce biofuels <sup>2</sup>

## 2.2 Emissions

The methodology used to calculate the UK's carbon emissions puts those from biomass combustion at zero. The justification being that they are simply returning the carbon back to the atmosphere that they absorbed when growing the past year (or more for coppice/wood). Any emissions linked to their production, transportation, processing etc would be assigned to the relevant source sectors (as with fossil fuels). Criteria for limits on these 'lifecycle emissions' are set out on the [Gov.uk](http://Gov.uk) website.

## 3 General EU regulatory framework

The use of renewable fuels in energy generation is a European Union policy. The [Renewable Electricity Directive](#) on the promotion of the use of energy from renewable sources established mandatory targets to be achieved by 2020 for a 20% overall share of renewable energy in the EU. To achieve the 20% target the Directive "set mandatory national targets. In order to reach these targets, Member States may operate support schemes and apply measures of cooperation" (Articles 3, 6 to 9).

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<sup>2</sup> Sources: Digest of UK energy statistics 2012, DECC; UK Greenhouse Gas Inventory, 1990 to 2010: Annual Report for submission under the Framework Convention on Climate Change, NAEI

Biomass is seen as a key contributor to meeting these aims. However, there have been studies questioning the environmental impact of the use of biomass, which has led to further clarification from the EU on the sustainability criteria for biomass use. These set out requirements on greenhouse gas emissions benefits and land-use impacts. Further details can be found in section 5.2 below

## 4 UK Biomass Policy

The UK Government has set out policies to support the use of biomass in energy generation in its [UK Biomass Strategy](#) published in 2012. This Strategy noted that

It is widely recognised that bioenergy has an important role to play if the UK is to meet its low carbon objectives by 2050<sup>1</sup>. Excluding biomass from the energy mix would significantly increase the cost of decarbonising our energy system – an increase estimated by recent analysis at £44 billion<sup>2</sup>. As set out in the 2011 UK Renewable Energy Roadmap, bioenergy is also an important part of the Government's plans to meet the Renewable Energy Directive objectives in 2020. There are however risks and uncertainties associated with bioenergy: whether it genuinely contributes to carbon reductions; the availability and price of sufficient sustainably-sourced biomass; the relationship between bioenergy and other uses of land, such as food production, and other uses of biomass, such as for construction materials; the environmental impacts on air quality, biodiversity and water resources.

The Government has also set out its support for biofuels/biomass in recent Parliamentary Questions:<sup>3</sup>

**Dr Francis:** To ask the Secretary of State for Energy and Climate Change (1) whether he has recently given consideration to the suitability of biomass as a sustainable source of energy; and if he will make a statement;

(2) what recent assessment he has made of the sustainability of biomass; if the Government will give consideration to reviewing its policy on biomass; and if he will make a statement.

**Gregory Barker:** The use of biomass to generate electricity and combined heat and power is good for our energy security; it makes a cost-effective contribution to a decarbonised energy mix and draws on a wide range of biomass sources to provide a controllable energy supply to help balance variable generation such as wind and solar. As set out in the 2012 UK Renewable Energy Roadmap, bioenergy is an important part of the Government's plans to meet the renewable energy directive objectives in 2020. Investment in new biomass generation will also create green jobs and business opportunities across the fuel supply chain.

We are committed to ensuring that the biomass used for energy, whether for heat, electricity or transport, in the UK is sustainable, cost-effective and does not give rise to unintended consequences. The Government's UK Bioenergy Strategy, published in April 2012, sets a framework of principles to guide the development of future UK bioenergy policy in a way that will secure its benefits, while managing its risks. This strategy was underpinned by extensive analysis of a wide range of evidence regarding the use of biomass for energy including commissioned research on the carbon impacts of different uses of biomass, and has been taken into account when determining our approach to the support for biomass electricity through the renewables obligation.

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<sup>3</sup> HC Deb 14 Jan 2013 col 480W

**Dr Francis:** To ask the Secretary of State for Energy and Climate Change what recent assessment he has made of the sufficiency of appropriate and sustainable supplies of fuel stocks for UK biomass plants; and if he will make a statement.

**Gregory Barker:** Analysis carried out for the UK Bioenergy Strategy (published in April 2012) indicated that total domestic and imported bioresource supply to the UK could range between 200-650 TWh in 2020 and 200-550 TWh in 2050. This range suggests sustainably sourced bioenergy could contribute around 8-11% to the UK's total primary energy demand by 2020 and around 12% by 2050 (within a wide range of 8% to 21%). This conclusion is consistent with many other studies. International supplies, particularly from North America, will be a key contributor to this deployment. Further information on this analysis can be found in the UK Bioenergy Strategy and the accompanying Analytical Annex.

As part of the Government Response to the RO Banding Review (published July 2012), DECC published an Impact Assessment which included consideration of the impact of its proposals on sustainably sourced wood resources. Building on the analysis developed for the Bioenergy Strategy, this suggested that potential resources available to the UK should be sufficient to meet both energy and wood products demand for woody biomass. Clearly, future demand for wood from other sectors and future supply, especially from imports, is extremely difficult to predict. DECC will work closely with biomass electricity generators to ensure robust monitoring measures are in place for biomass feedstocks to provide early warning of supply risks from the electricity sector.

In December 2011, the Committee on Climate Change considered the future role of biomass in helping the UK to meet its climate change targets as part of a [major review of bioenergy](#). The review came down firmly on the side of co-fired biomass at a large scale and new, dedicated biomass at small scale.

The Committee concluded that:

...there should be limited if any support for new large-scale, dedicated biomass generation and that any longer term role for new dedicated biomass power plants without Carbon Capture and Storage (CCS) should be limited given its relatively high cost compared to other options for power sector decarbonisation.

– Detailed analysis of the power sector suggests this result also holds for the near term, and that any near-term investment should be limited to biomass co-firing and the conversion of existing coal-fired power plants.

– Therefore while the Government's current focus on co-firing and conversion is appropriate, safeguards should be introduced to ensure that proposed support for new dedicated biomass under the Renewables Obligation (RO) does not result in unnecessary cost escalation or increased emissions. For new dedicated biomass power plants, support should be limited to small-scale plants and combined heat and power (CHP) plants or, at a minimum, support for large-scale new dedicated biomass should be limited to a very small number of projects.<sup>4</sup>

The [Environment Agency](#) supports the use of biomass but notes that there are two key challenges:

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<sup>4</sup> Committee on Climate Change, [HBioenergy Review](#)H, December 2011

1. Biomass energy should be developed in a way that provides the greatest reductions in greenhouse gas emissions possible at an acceptable financial cost; and
2. Biomass should be produced sustainably in order that negative environmental impacts, such as on soils, groundwater, air quality, forests and water resources, are reduced as far as possible

## 5 Sustainability Criteria for Biomass

### 5.1 UK Bioenergy Strategy principles

The UK Bioenergy Strategy was published jointly by DECC, Defra and DfT in April 2012 and has sustainability as its overarching principle.

The [Ministerial Foreword](#) to the Strategy states its purpose as setting out the Coalition Government's approach to:

“achieving sustainable, low-carbon bioenergy deployment by defining a framework of principles that will govern future policies”.<sup>5</sup>

The Government acknowledges in the Strategy that bioenergy is not automatically low carbon, renewable or sustainable but it is expected to play a key role in enabling the UK to meet its 2020 renewables targets as well as longer term carbon reduction targets to 2030 and 2050.

The Strategy states that the UK Government has a responsibility to ensure that its policies only support bioenergy use in the right circumstances. The Strategy therefore sets out a statement of four principles to act as a framework for future policy on bio-energy indicating to stakeholders in which circumstances the Government is likely to support bio-energy. In summary, these state that:

- Policies that support bioenergy should deliver genuine carbon reductions that help meet UK carbon emissions objectives to 2050 and beyond.
- Support for bioenergy should make a cost effective contribution to UK carbon emission objectives in the context of overall energy goals.
- Support for bioenergy should aim to maximise the overall benefits and minimise costs (quantifiable and non-quantifiable) across the economy.
- At regular time intervals and when policies promote significant additional demand for bioenergy in the UK, beyond that envisaged by current use, policy makers should assess and respond to the impacts of this increased deployment on other areas, such as food security and biodiversity.<sup>6</sup>

The strategy notes that current sustainability standards applied to renewables incentives will need to be more stringent in order to meet these principles. It advises that this should be done on an ambitious timetable which also allows the supply chain to respond. The Strategy sets out a number of measures to improve the sustainability approach to bioenergy:

- The introduction of global carbon accounting to increase transparency with a commitment that the UK will continue to press for this.

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<sup>5</sup> DECC, Defra, DfT, [HBioenergy Strategy](#)H, April 2012, p.3

<sup>6</sup> Ibid, Executive Summary, p.6

- Improving the opportunities from domestic supplies
- Promoting the development of sustainable supply markets
- Promoting the deployment of low-risk technological options

## 5.2 Current sustainability criteria

Background information on bioenergy and sustainability can be found in the July 2012 POST Note [Bioenergy](#).

[EU sustainability criteria for biofuels](#) have been applied since 2010 (Directive 2009/28/EC). They are mandatory for liquid biofuels and there is a voluntary framework for solid biomass and biogas. These criteria impose restrictions on using materials sourced from land with high biodiversity value (e.g. rainforests), or high carbon stock (e.g. peatlands). There are minimum requirements for lifecycle Greenhouse Gas Savings (GHG) compared with fossil fuels.

In the UK, sustainability criteria are mandatory for bioenergy used for electricity generation, transport and heat production.

In April 2011, reporting against sustainability criteria for solid biomass and biogas was introduced under the Renewables Obligation (RO), the Government's main support mechanism for renewables. The sustainability criteria include a minimum lifecycle greenhouse gas emissions (GHG) saving compared to the use of fossil fuel and restrictions on land use. Biomass power generators above 50KW are required to report to the regulator on their performance against these criteria. The Government consulted on improvements to these criteria in November 2012.

## 5.3 Consultation on sustainability criteria

The Government launched a public consultation in September 2012 [proposing improvements to the biomass sustainability criteria set under the Renewables Obligation \(RO\)](#). The consultation stated that it is "essential that we take action to ensure the biomass used in the UK is sustainable, delivers real carbon savings and protects valuable habitats at home and abroad".<sup>7</sup> The consultation closed on 30 November 2012. The [consultation documents](#) are available on the DECC website.<sup>8</sup>

Section 2, page 18 of the [document](#) helpfully sets out the current sustainability criteria and why changes are being considered.

The Government asked for comments on two main sustainability proposals:

- i: Requiring power and CHP generators of 1MWe capacity and above to meet the sustainability criteria to receive support under the RO for solid biomass & biogas electricity from October 2013 and to provide a statement of independent verification; and
- ii: Expanding the set of sustainability criteria for solid biomass and biogas from October 2013 to include:

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<sup>7</sup> DECC, [HConsultation of proposals to ensure sustainability and affordability for the use of biomass under the renewables obligation](#), September 2012, p.3

<sup>8</sup> DECC, [HConsultation of proposals to ensure sustainability and affordability for the use of biomass under the renewables obligation](#), September 2012

a. sustainable forest management. We propose solid wood-fuel will be required to meet the UK Government's public procurement policy for wood in order to demonstrate meeting the land criteria; and

b. tightening the limits on carbon emissions while also enabling investment across the supply-chain by fixing the sustainability criteria from October 2013 to April 2020, with the application of the proposed GHG trajectories of:

- new dedicated biomass (with and without CHP) at 240 kg CO<sub>2</sub>eq per MWh, potentially reducing to 200 kg CO<sub>2</sub>eq per MWh in 2020 subject to the ability of the supply chain to deliver this reduction;

- existing dedicated biomass accredited before April 2013, at 285.12 kg CO<sub>2</sub>eq per MWh, potentially reducing to 200kg CO<sub>2</sub>eq per MWh in 2020 subject to the ability of the supply chain to deliver this reduction, and - coal plant converting to or co-firing with biomass at 285.12kg CO<sub>2</sub>eq per MWh reducing to 240kg CO<sub>2</sub>eq per MWh in 2020 subject to the ability of the supply chain to deliver this reduction.<sup>9</sup>

### **Indirect land use change**

The EU sustainability criteria do not currently include a consideration of Indirect land use change (ILUC). The Government has committed to change this:

As the main aim of Government support for bioenergy is to reduce carbon, it is crucial that looking post-2020, that our policies take account of the best available evidence on indirect land use change, and that we prevent deforestation and protect food production. We are working with our European partners on this issue and have called for the European Commission to amend the sustainability standards applied across the EU to address the risk from ILUC.<sup>10</sup>

ILUC occurs when existing agricultural produce or land is used for bioenergy. For example if oilseed rape is used to make biodiesel. There may be no direct land use change but the diversion of the produce/land away from existing uses may lead to an increase in price leading to greater production elsewhere both through more intensive production and bringing more land into production.<sup>11</sup>

ILUC emissions are inherently uncertain. The vast majority of studies have however concluded that ILUC leads to increased greenhouse gas emissions for biofuels produced from conventional crops. Not all feedstocks have the same ILUC impacts but when ILUC is considered, some biofuels can have greater carbon impacts than fossil fuel alternatives.

The European Commission (Directorate General Trade) commissioned work from the International Food Policy Institute (IFPI) assessing land use change consequences of European biofuel policies. The IFPI's [final report](#) was published in October 2011.<sup>12</sup> The Commission has a range of other studies underway which seek to better understand the magnitude of land use changes.<sup>13</sup>

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<sup>9</sup> Ibid p.8

<sup>10</sup> DECC, [Consultation of proposals to ensure sustainability and affordability for the use of biomass under the renewables obligation](#), September 2012, para 6.7

<sup>11</sup> European Biofuels Technology Platform, [Biofuels and Sustainability Issues](#) as on 21 November 2012

<sup>12</sup> IFPI, [Assessing land use change consequences of European biofuel policies](#),

<sup>13</sup> EU Commission, [Studies – Land use change](#) as on 21 November 2012

Current sustainability standards *do* account for direct land use changes (dLUC) e.g. where an energy crop is grown on unused land. The Government's new sustainability criteria proposals state that the UK's sustainability criteria will have to be amended if sustainability criteria change at EU level.

The matter was discussed at the recent EU Energy Council on 22 February 2013:

The presidency then held an orientation debate on the Commission's proposal on indirect land use change (ILUC), which attempts to reduce the greenhouse gas associated impacts of first generation land-based biofuels. The Commission noted that it could be flexible with respect to the cap of 5% on the contribution of first generation biofuels towards the 10% renewable energy target for transport and in relation to the recognition of the different greenhouse gas impacts of biodiesel and bioethanol. I agreed that a single approach was not helpful as the evidence indicated that bioethanol and biodiesel have very different ILUC implications and suggested that basing the proposal instead on the ILUC factors of biofuels would be a more appropriate way of tackling the problem and would allow investment to continue in more sustainable bioethanol. A number of member states supported this position. Most member states considered that the 5% cap on industry was too restrictive and damaging to investor confidence.<sup>14</sup>

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<sup>14</sup> [HHL Deb 4 March 2013 WS120](#)