Dirtier than coal?

Why Government plans to subsidise burning trees are bad news for the planet

RSPB

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Summary

The UK Bioenergy Strategy set a clear direction for future bioenergy policy, including commitments to only support sustainable bioenergy that delivers genuine greenhouse gas emission reductions. These principles are now being undermined by Government's proposals to continue to subsidise large-scale power generation from wood.

The Government's own analysis, provided to Princeton academic Timothy Searchinger[1], shows that the use of whole trees in this way would increase greenhouse gas emissions by at least 49% compared to using coal over 40 years. Yet, Government's current proposals, to continue to subsidise biomass power under the Renewables Obligation, do not account for this by distinguishing between different sources of biomass. They are therefore likely to actually increase greenhouse gas emissions.

Friends of the Earth, Greenpeace and the RSPB are therefore calling for:

1 An immediate review and revision of DECC's impact assessment to include the emissions that arise as a result of the time delay between combustion and forest re-growth, and from taking wood out of existing industries that may have to use non-wood alternatives, such as plastic and concrete.

2 The withdrawal of public subsidy via the Renewables Obligation and Feed-in Tariff for generating electricity from feedstocks derived from tree trunks (roundwood and sawlogs).

3 A refocus of support for bioenergy on the use of wastes and other feedstocks that are harvested sustainably, and where indirect substitution emissions can be shown to be minimal. This would guarantee emission reductions.

4 A comprehensive accounting system to be developed for biomass that includes carbon debt and indirect emissions from product substitution.

Background

DECC are currently consulting[2] on proposals that will determine the level of public subsidy for bioenergy, along with the sustainability and carbon standards that generators will have to meet to claim their subsidy.

DECC claims that these proposals will ensure 'sustainability and affordability' for the use of biomass, and argues that the need to reduce carbon emissions is one of the key reasons for continuing to support biomass power, alongside security of supply. The consultation is supported by an impact assessment[3] that attempts to substantiate these benefits.

The consultation follows the UK Bioenergy Strategy[4], published in early 2012, which established a number of key principles for bioenergy. Critically, these included the following commitment: "Policies that support bioenergy should deliver genuine carbon reductions that help meet UK carbon emissions objectives to 2050 and beyond". This promise is in danger of being broken, as DECC have chosen to exclude a number of key sources of emissions associated with bioenergy in their calculations, significantly over-estimating the climate benefits of generating electricity from wood.

1 Searchinger (2012) Sound principles and an important inconsistency in the 2012 UK Bioenergy Strategy
2 DECC (2012) Biomass Electricity & Combined Heat & Power plants – ensuring sustainability and affordability http://www.decc.gov.uk/assets/decc/11/consultation/ro-banding/6339-consultation-on-biomass-electricity--combined-hea.pdf
3 http://www.decc.gov.uk/assets/decc/11/consultation/ro-banding/6342-impact-assessment-biomass-electricity-and-combined.pdf
4 DECC, Defra & Dft (2012) The UK Bioenergy Strategy http://www.decc.gov.uk/assets/decc/11/meeting-energy-demand/bio-energy/5142-bioenergy-strategy-.pdf

Flawed emission accounting

DECC have proposed a limit on life cycle greenhouse gas emissions from biomass power that ranges from 200 to 285g CO_2/kWh, but the standard is fundamentally flawed. It doesn't count significant emissions to the atmosphere for electricity that is generated from wood harvested from forests, significantly over-estimating the climate benefits.

Theoretically, this is a saving of 43–60% in comparison with the current grid average in the UK. The standard includes emissions from harvesting, transporting, drying, processing and converting the biomass into energy, However, DECC have chosen to omit two large sources of emissions: 'carbon debt' and 'indirect substitution'. Taken together, these omissions make the greenhouse gas limit meaningless. Recent research suggests that full accounting for carbon debt alone makes generating electricity from wood a bad idea if we want to reduce greenhouse gas emissions.

1 Carbon debt

As with any organic material, when wood is burnt, $C0_2$ is emitted – one tonne of dry wood burnt in a power station will emit 1.8 tonnes of CO_2 into the atmosphere[5]. Yet DECC has chosen to ignore these emissions and hasn't counted them in their proposed emission limit; they argue that the carbon released is offset by the carbon absorbed by growing the forest. Effectively, they assume that biomass itself is a 'carbon-free asset'. This means that the very real carbon emitted by the smokestacks of powerplants can be completely ignored, on the assumption that it is offset by the growth of trees. Unfortunately, this ignores the fact that forests are already growing and already storing carbon, and when the trees are harvested and burnt, that carbon storage is reduced and the carbon that was in the tree is released into the atmosphere.

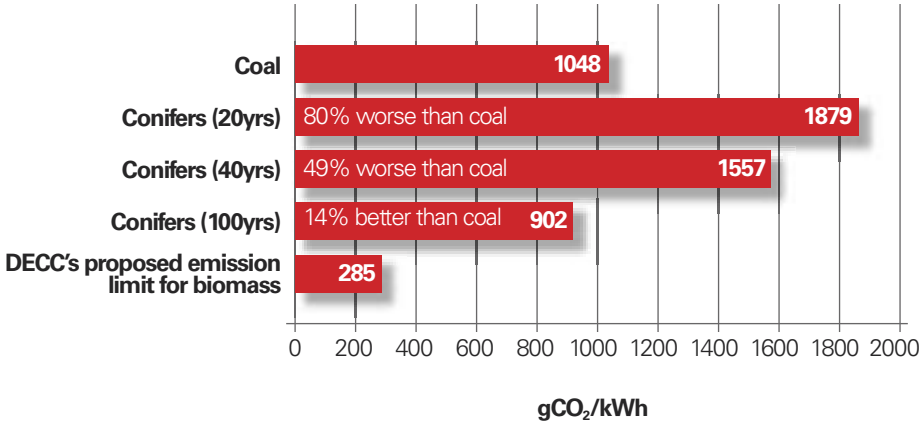
Clearly, if the land remains forested, the trees will grow back. But the trees would also continue to grow if not harvested. Eventually, tree growth slows down as trees mature. That means that the regrowing forest can catch up with the forest if left alone. But that takes a long time. During the intervening period, the harvest of wood has added carbon to the air. And that matters because that means global warming has increased. The "carbon debt" refers to this increase of carbon in the atmosphere, and the "carbon payback" refers to the delay before such carbon neutrality can be assumed in practice. A variety of studies have found that this carbon debt will typically last many decades.

Perhaps the first person to recognize this mistake was Timothy Searchinger, a researcher at Princeton University who specialises in bioenergy, and whose previous papers uncovered the bioenergy accounting flaws. Searchinger used DECC data (which was used to produce Figure 4 in the UK Bioenergy Strategy), to calculate that over a 20-year period, emissions from power generation using wood from conifer plantations are 1879 g/kWh. That is 80% greater than coal power. Over a 40-year period emissions are lower because the trees have had longer to re-capture carbon, but even then biomass emissions would be 49% greater than coal power. Only after 100 years does electricity generation from conifer trees perform better than coal. And, regardless of the time period, it's never better than the current grid average and never meets DECC's proposed maximum emission limit for biomass (Figure 1). These figures should be seen in the context of the Climate Change Committee's recommendation, that the power sector in the UK needs to reduce its emission intensity from the current average of 500g CO_2/kWh to 50g by 2030[6]. This is not a lifecycle standard, but it demonstrates the fact that biomass power – even with a flawed accounting system – can only have a limited role to play in the longer-term.

[5] Haberl et al. (2012) Correcting a fundamental error in greenhouse gas accounting related to bioenergy Energy Policy in press
[6] Committee on Climate Change (2010) *The Fourth Carbon Budget - Reducing emissions through the 2020s*

This means that burning whole trees in power stations would make global warming worse, undermining goals of reducing our greenhouse gases by 2050. Unfortunately, whilst this is recognised in part of the UK Bioenergy Strategy, subsequent parts of the Strategy and DECC's current proposals ignore it and revert to the assumption that biomass power is automatically carbon free.

Figure 1 -The implications of carbon debt - lifecycle greenhouse gas emissions per kWh of electricity[7]



2 Indirect substitution emissions

Regardless of where whole trees come from, their use for electricity generation will contribute to climate change for decades. But where will biomass come from to power expanded bioenergy in the UK?

The UK produces about 10 million tonnes of green wood each year. Most (98%) of this is softwood, three-quarters of which is used in sawmills and for wood panels. A further 11% is used as woodfuel already. Whilst domestic sources currently provide most biomass used in electricity generation in the UK, this cannot be sustained as the sector grows. DECC expect approximately 80% of feedstock to come from imports in the future[9]. This finding was reflected in a 2011 RSPB review[9] of planning applications for new biomass power stations (Figure 2). This is because the UK has a limited domestic wood resource that is already in demand from other industries: domestic wood production supplies only 20% of the wood-based products we consume.

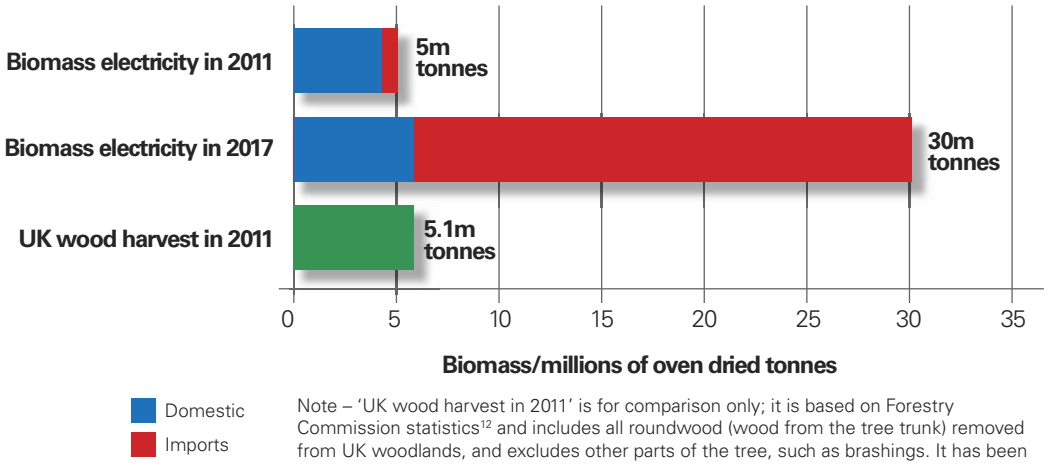
The significant role that imported wood is expected to play in generating electricity in the UK, and the risk that this poses as a result of carbon debt, is confirmed by Forest Research in their report to DECC[8], which advises:

"The possibility that [UK bioenergy demand] might be met from ongoing management of forest areas already in production was explored, but finally discounted on both a pure theoretical basis and in the light of evidence on likely changes to patterns for wood demand. Instead it was concluded that a significant increase in requirement for imported wood in the UK would entail intensification of the management of forests in other countries, similar in some respects to restoration of management in neglected forests."

Demand for wood, for electricity generation, will therefore add to the existing trade imbalance, given that UK consumption is already principally met through imports. If this demand is met from UK sources, then wood will be diverted from existing uses, such as construction and wood panels, forcing substitution with either imported wood or non-wood alternatives such as concrete and plastic. DECC's own research[10] shows that diverting roundwood and sawlogs (i.e. wood from the tree trunk) into bioenergy results in negligible or increased emissions. This is true even when the carbon emissions from combustion are not counted because the original uses for this wood are substituted with higher carbon alternatives.

7 Data from Searchinger (2012) Sound principles and an important inconsistency in the 2012 UK Bioenergy Strategy
8 Forest Research & North Energy (2011) Carbon impacts of using biomass in bioenergy and other sectors: forests p. 60
9 RSPB (2011) Bioenergy – a burning issue http://www.rspb.org.uk/Images/Bioenergy_a_burning_issue_1_tcm9-288702.pdf
10 Forest Research & North Energy (2011) Carbon impacts of using biomass in bioenergy and other sectors: forests p.163

Figure 2 - Demand for biomass for electricity generation in the UK compared to wood production[11]



Note – 'UK wood harvest in 2011' is for comparison only; it is based on Forestry Commission statistics[12] and includes all roundwood (wood from the tree trunk) removed from UK woodlands, and excludes other parts of the tree, such as brashings. It has been converted into oven-dried tonnes to allow a comparison with demand from the electricity sector.

Maximum emission reductions are made from forests when the roundwood and sawlogs go into conventional wood markets, such as construction and panels, and only the offcuts and brashings are used for bioenergy. This is because the carbon is retained in timber when it is used in construction, furniture, fencing, etc – whereas it is immediately released into the atmosphere when used for energy. Offcuts and brashings are best used for woodfuel, because there are few alternative uses.

This failure to account for indirect substitution emissions directly contradicts the UK Bioenergy Strategy which contains explicit and important principles for carbon accounting. Specifically, the Strategy commits to accounting for "the emissions resulting from redirecting biomass from other uses which store carbon," including the carbon storage if trees were "left in the forest to complete their natural lives."

[11] Source – RSPB (2011) Bioenergy – a burning issue; DECC (2012) Impact assessment - consultation on proposals for the levels of banded support for solar PV under the Renewables Obligation for the period 2013-17

[12] Forestry Commission (2012) Forestry Statistics 2012 - UK-Grown Timber http://www.forestry.gov.uk/website/forstats2012.nsf/LUContents/88BDD8FEA0D881448025734E004F27BB

Implications of the carbon accounting flaws

DECC's current failure to account for the emissions from carbon debt and the substitution is a major flaw in bioenergy policy. Continuing to underpin UK policy in this way will come at considerable cost to the public, and have a damaging impact our climate.

DECC has not, as yet, analysed the proportion of the biomass supply chain that is at risk of carbon debt, and therefore it is difficult to estimate the total impact this could have. However, for indicative purposes, if we assume that whole trees constitute even just 50% of the biomass used for electricity generation, then emissions from the UK electricity generation sector would increase by 5 million tonnes of CO2, i.e. approximately 3% of current total emissions from the power sector. In the absence of better data, 50% seems a reasonable assumption, given that imports are expected to make up 80% of supply, and a proportion of these will be from non-forest sources and existing forestry that is not affected by carbon debt (because, for example, it previously supplied another market that has since shrunk). Even if 25% of the biomass used in electricity generation results in carbon debt, emissions would increase by approximately two million tonnes of CO2, or 1.5% of total current emissions from electricity generation.

The overall implications of increasing the cost of wood for other industries, and the resulting emissions from the substitution of wood products, are unclear but likely to be considerable given that, according to the UK Bioenergy Strategy, substitution often results in even higher emissions. Indeed, it's already clear that bioenergy is having such an effect from the Wood Panel Industries Federation campaign for subsidies for biomass to be removed because they are concerned about the impact on their industry[13].

[13] E.g. http://www.stopburningourtrees.org/

Recommendations

The Government's proposals for continued subsidies for biomass electricity, and an emission limit to mitigate the effect this will have on our climate, are based on fundamentally flawed data relating to greenhouse gas implications.

DECC's proposals therefore misrepresent the cost effectiveness of the emission reductions for British consumers. We believe that this threatens the UK's short and long term commitments to reducing greenhouse gas emissions under the Climate Change Act (2008), at least in terms of actual emissions to the atmosphere in the critical period to 2050, within which we must avert dangerous climate change.

We are therefore calling for:

1 An immediate review and revision of DECC's impact assessment to include emissions from carbon debt and indirect substitution.

2 The withdrawal of public subsidies for generating electricity from feedstocks derived from tree trunks (roundwood and sawlogs).

3 A refocus of support for bioenergy on the use of wastes and other feedstocks that are harvested sustainably and where indirect substitution emissions can be shown to be minimal. This would guarantee emissions reductions.

4. A comprehensive accounting system to be developed for biomass that includes carbon debt and indirect emissions from product substitution.

David J Slater (rspb-images.com)

DECC research shows that wood from the trunks of conifers such as these are best used in construction and furniture rather than for energy production.

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