Title:	Impact Assessment (IA)
Sustainability criteria for biomass and bioliquids in the Renewables Obligation	**URN: 10D/761**
Lead department or agency: DECC	**Date: 16/07/2010**
Other departments or agencies: DfT	**Stage:** Development/Options
	Source of intervention: Domestic
	Type of measure: Primary legislation
	Contact for enquiries: Ewa Kmietowicz

Summary: Intervention and Options

What is the problem under consideration? Why is government intervention necessary?

Biomass is plant or animal matter of recent origin. It includes such materials as wood, food waste, manures, miscanthus grass, wheat and rapeseed oil. Biomass can be used to generate heat and electricity, or to produce transport fuel. GHG savings from the use of biomass only accrue if the material is replaced through replanting. As demand for woodfuel increases, there is the risk that biomass could be harvested by simply clearing large areas of tropical rainforest. The resulting land use change would deliver a large increase in greenhouse gas emissions, as well as destruction of a rare, highly biodiverse habitat. It could also spark damaging headlines impacting the credibility and confidence of the bioenergy industry. There are therefore important sustainability concerns to be addressed.

What are the policy objectives and the intended effects?

The policy objectives are four-fold. The introduction of sustainability criteria would
- ensure that growth in bioenergy also delivers on the UK's wider carbon and energy security ambitions,
- reduce uncertainty to encourage investment in new UK generation and biomass feedstoc supplies,
- promote good practice on sustainable feedstock sourcing and drive underperformers to improve, and
- help secure the support of local government & public to proposed new bioenergy developments.

In addition failure to transpose the RED requirement introducing sustainability criteria for biofuels and bioliquids will lead to infraction proceedings by the Commission.

What policy options have been considered? Please justify preferred option (further details in Evidence Base)

For solid and gaseous biomass, the options considered are (i) do nothing (ii) comply with EU recommendations and (iii) implement stricter GHG savings criteria than those recommended by EU.

For bioliquids the options considered are: (i) do not implement RED obligations. and (ii) (preferred option): implement RED sustainability criteria for bioliquids: Introducing sustainability criteria would restrict incentives to only those bioliquids which passed the sustainability criteria, and allow Government to support those bioliquids for electricity that contribute towards delivery of the renewable energy target.

When will the policy be reviewed to establish its impact and the extent to which the policy objectives have been achieved?	It will be reviewed 01/2010
Are there arrangements in place that will allow a systematic collection of monitoring information for future policy review?	Yes

SELECT SIGNATORY Sign-off For consultation stage Impact Assessments:

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible SELECT SIGNATORY:..... Date:.....

Summary: Analysis and Evidence

Policy Option 1

Description:

Implement sustainability standards for solid and gaseous biomass in the electricity sector in line with EU recommended criteria: 35% GHG savings in 2010 rising to 60% in 2018. Goes beyond voluntary sustainability scheme for biomass as laid out in the RED.

Price Base Year 2009	PV Base Year 2010	Time Period Years 20	Net Benefit (Present Value (PV)) (£m)		
			Low: £0m	High: £55m	Best Estimate:£25m

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low			Optional	-£25m
High			Optional	£35m
Best Estimate				£5m

Description and scale of key monetised costs by 'main affected groups'

The costs show the impact of introducing sustainability criteria thresholds in line with EU recommended criteria for member states that wish to introduce such criteria. Sustainability standards could reduce the amount of biomass in electricity generation, which would have to be replaced by other technologies to meet the RES 2020 target. Costs relate to resource costs of renewable generation. Costs include estimated administration costs on biomass suppliers and operators.

Other key non-monetised costs by 'main affected groups'

The policy could lead to indirect land use changes which are not known. There could be indirect costs on the economy of increased electricity prices and bills but the scale of these is likely to be minimal.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional		Optional	
High	Optional		Optional	
Best Estimate			£0.1m	**£30m**

Description and scale of key monetised benefits by 'main affected groups'

Benefits include the value of higher GHG savings due to the introduction of GHG savings thresholds. GHG savings are estimated on a lifecycle basis.

Other key non-monetised benefits by 'main affected groups'

There could be other benefits such as preservation of biodiversity, water and soil quality gains, nature protected areas and areas of high carbon stock. These are indirect impacts which are not possible to quantify. There could be indirect land use changes which are currently not known.

Key assumptions/sensitivities/risks **Discount rate (%)** 3.5%

The key assumption is the supply of biomass now and in the future, and the life-cycle analysis (LCA) of these pathways. These are uncertain and different studies point to different estimates. A key risk is the unknown LCA of the full range of imports likely to be needed in the bioenergy sector to meet the RES target. Other uncertainties relate to costs of renewable generation technologies, and future electricity and carbon prices.

Impact on admin burden (AB) (£m):	Impact on policy cost savings (£m):	In scope

New AB:	AB savings:	Net:	Policy cost savings:	Yes/No

Enforcement, Implementation and Wider Impacts

What is the geographic coverage of the policy/option?			England and Wales		
From what date will the policy be implemented?			01/04/2011		
Which organisation(s) will enforce the policy?			ofgem		
What is the annual change in enforcement cost (£m)?			n.a.		
Does enforcement comply with Hampton principles?			Yes		
Does implementation go beyond minimum EU requirements?			No		
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded:** -1.2	**Non-traded:**	
Does the proposal have an impact on competition?			No		
What proportion (%) of Total PV costs/benefits is directly attributable to primary legislation, if applicable?			**Costs:**	**Benefits:**	
Annual cost (£m) per organisation (excl. Transition) (Constant Price)	**Micro**	**< 20**	**Small**	**Medium**	**Large**
Are any of these organisations exempt?	Yes	Yes/No	Yes	No	No

Specific Impact Tests: Checklist

Set out in the table below where information on any SITs undertaken as part of the analysis of the policy options can be found in the evidence base. For guidance on how to complete each test, double-click on the link for the guidance provided by the relevant department.

Please note this checklist is not intended to list each and every statutory consideration that departments should take into account when deciding which policy option to follow. It is the responsibility of departments to make sure that their duties are complied with.

Does your policy option/proposal have an impact on…?	**Impact**	**Page ref within IA**
Statutory equality duties[1] Statutory Equality Duties Impact Test guidance	Yes/No	
Economic impacts		
Competition Competition Assessment Impact Test guidance	Yes/No	
Small firms Small Firms Impact Test guidance	Yes/No	
Environmental impacts		
Greenhouse gas assessment Greenhouse Gas Assessment Impact Test guidance	Yes/No	
Wider environmental issues Wider Environmental Issues Impact Test guidance	Yes/No	
Social impacts		
Health and well-being Health and Well-being Impact Test guidance	Yes/No	
Human rights Human Rights Impact Test guidance	Yes/No	
Justice system Justice Impact Test guidance	Yes/No	
Rural proofing Rural Proofing Impact Test guidance	Yes/No	
Sustainable development Sustainable Development Impact Test guidance	Yes/No	

[1] Race, disability and gender Impact assessments are statutory requirements for relevant policies. Equality statutory requirements will be expanded 2011, once the Equality Bill comes into force. Statutory equality duties part of the Equality Bill apply to GB only. The Toolkit provides advice on statutory equality duties for public authorities with a remit in Northern Ireland.

Summary: Analysis and Evidence

Policy Option 2

Description:

Implement sustainability standards for solid and gaseous biomass in the electricity sector of 60% GHG saving threshold relative to the EU comparator from 2013 (Recommended option).

PRICE BASE YEAR GHG	PV BASE YEAR	TIME PERIOD YEARS	NET BENEFIT (PRESENT VALUE (PV)) (£M)		
			LOW: -£85M	HIGH:£395M	BEST ESTIMATE £155M

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	Optional		Optional	**-£190m**
High	Optional		Optional	**£285m**
Best Estimate				**£50m**

Description and scale of key monetised costs by 'main affected groups'

This is the cost of introducing sustainability criteria beyond the EU recommended criteria on costs of meeting the RES. Sustainability standards could reduce the amount of biomass in electricity generation, which would have to be replaced by other technologies to meet the RES 2020 target. Costs relate to resource costs of renewable generation. Costs include estimated administration costs on biomass suppliers and operators.

Other key non-monetised costs by 'main affected groups'

The policy could lead to indirect land use changes which are not known. There could be indirect costs on the economy of increased electricity prices and bills but the scale of these is likely to be minimal.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional		Optional	
High	Optional		Optional	
Best Estimate				**£205m**

Description and scale of key monetised benefits by 'main affected groups'

Benefits include the value of of higher GHG savings due to the introduction of GHG savings thresholds. GHG savings are estimates on a lifecycle basis.

Other key non-monetised benefits by 'main affected groups'

There could be other benefits such as preservation of biodiversity, waste and soil quality gains, nature protected areas and areas of high carbon stock. These are indirect impacts which are not possible to quantify. There could be indirect land use changes which are currently unknown.

Key assumptions/sensitivities/risks **Discount rate (%)** 3.5%

The key assumption is the supply of biomass now and in the future, and the life-cycle analysis (LCA) of these pathways. These are uncertain and different studies point to different estimates. A key risk is the unknown LCA of the full range of imports likely to be needed in the bioenergy sector to meet the RES target. Other uncertainties relate to costs of renewable generation technologies, and future electricity and carbon prices.

IMPACT ON ADMIN BURDEN (AB) (£M):			IMPACT ON POLICY COST SAVINGS	IN SCOPE
NEW AB:	AB SAVINGS:	NET:	POLICY COST SAVINGS:	Yes/No

Enforcement, Implementation and Wider Impacts

What is the geographic coverage of the policy/option?			England and Wales		
From what date will the policy be implemented?			01/04/2011		
Which organisation(s) will enforce the policy?			ofgem		
What is the annual change in enforcement cost (£m)?					
Does enforcement comply with Hampton principles?			Yes		
Does implementation go beyond minimum EU requirements?			Yes		
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded:** -8	**Non-traded:**	
Does the proposal have an impact on competition?			No		
What proportion (%) of Total PV costs/benefits is directly attributable to primary legislation, if applicable?			**Costs:**	**Benefits:**	
Annual cost (£m) per organisation (excl. Transition) (Constant Price)	**Micro**	**< 20**	**Small**	**Medium**	**Large**
Are any of these organisations exempt?	Yes	Yes/No	Yes	No	No

Specific Impact Tests: Checklist

Set out in the table below where information on any SITs undertaken as part of the analysis of the policy options can be found in the evidence base. For guidance on how to complete each test, double-click on the link for the guidance provided by the relevant department.

Please note this checklist is not intended to list each and every statutory consideration that departments should take into account when deciding which policy option to follow. It is the responsibility of departments to make sure that their duties are complied with.

Does your policy option/proposal have an impact on…?	**Impact**	**Page ref within IA**
Statutory equality duties[2] Statutory Equality Duties Impact Test guidance	Yes/No	
Economic impacts		
Competition Competition Assessment Impact Test guidance	Yes/No	
Small firms Small Firms Impact Test guidance	Yes/No	
Environmental impacts		
Greenhouse gas assessment Greenhouse Gas Assessment Impact Test guidance	Yes/No	
Wider environmental issues Wider Environmental Issues Impact Test guidance	Yes/No	
Social impacts		
Health and well-being Health and Well-being Impact Test guidance	Yes/No	
Human rights Human Rights Impact Test guidance	Yes/No	
Justice system Justice Impact Test guidance	Yes/No	
Rural proofing Rural Proofing Impact Test guidance	Yes/No	
Sustainable development Sustainable Development Impact Test guidance	Yes/No	

[2] Race, disability and gender Impact assessments are statutory requirements for relevant policies. Equality statutory requirements will be expanded 2011, once the Equality Bill comes into force. Statutory equality duties part of the Equality Bill apply to GB only. The Toolkit provides advice on statutory equality duties for public authorities with a remit in Northern Ireland.

Summary: Analysis and Evidence

Policy Option 3

Description:

Implement sustainability standards for solid and gaseous biomass in the electricity sector of 70% GHG saving threshold relative to the EU comparator from 2013.

PRICE BASE YEAR	PV BASE YEAR	TIME PERIOD YEARS	NET BENEFIT (PRESENT VALUE (PV)) (£M)		
			LOW: -£295M	HIGH: £1010M	BEST ESTIMATE: £360M

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	Optional		Optional	**-£520m**
High	Optional		Optional	**£780m**
Best Estimate				**£130m**

Description and scale of key monetised costs by 'main affected groups'

This is the cost of introducing sustainability criteria beyond the EU recommended thresholds on costs of meeting the RES. Sustainability standards could reduce the amount of biomass in electricity generation, which would have to be replaced by other technologies to meet the RES 2020 target. Costs relate to resource costs excluding the cost of carbon for fossil fuel generation. Costs include estimated administration costs on biomass suppliers and operators.

Other key non-monetised costs by 'main affected groups'

The policy could lead to indirect land use changes which are not known. There could be indirect costs on the economy of increased electricity prices and bills but the scale of these is likely to be minimal.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional		Optional	**Optional**
High	Optional		Optional	**Optional**
Best Estimate				**£490m**

Description and scale of key monetised benefits by 'main affected groups'

Benefits include the value of higher GHG savings due to the introduction of GHG savings thresholds. GHG savings are estimated on a lifecycle basis.

Other key non-monetised benefits by 'main affected groups'

There could be other benefits such as preservation of biodiversity, waste and soil quality gains, nature protected areas and areas of high carbon stock. These are indirect impacts which are not possible to quantify. There could be indirect land use changes which are currently unknown.

Key assumptions/sensitivities/risks **Discount rate (%)** 3.5%

The key assumption is the supply of biomass now and in the future, and the life-cycle analysis (LCA) of these pathways. These are uncertain and different studies point to different estimates. A key risk is the unknown LCA of the full range of imports likely to be needed in the bioenergy sector to meet the RES target. Other uncertainties relate to costs of renewable generation technologies, and future electricity and carbon prices.

IMPACT ON ADMIN BURDEN (AB) (£M):			IMPACT ON POLICY COST SAVINGS	IN SCOPE
NEW AB:	AB SAVINGS:	NET:	POLICY COST SAVINGS:	Yes/No

Enforcement, Implementation and Wider Impacts

What is the geographic coverage of the policy/option?			England and Wales		
From what date will the policy be implemented?			01/04/2011		
Which organisation(s) will enforce the policy?			ofgem		
What is the annual change in enforcement cost (£m)?			n.a.		
Does enforcement comply with Hampton principles?			Yes		
Does implementation go beyond minimum EU requirements?			Yes		
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded:** -20	**Non-traded:**	
Does the proposal have an impact on competition?			No		
What proportion (%) of Total PV costs/benefits is directly attributable to primary legislation, if applicable?			**Costs:**	**Benefits:**	
Annual cost (£m) per organisation (excl. Transition) (Constant Price)	**Micro**	**< 20**	**Small**	**Medium**	**Large**
Are any of these organisations exempt?	Yes	Yes/No	Yes	No	No

Specific Impact Tests: Checklist

Set out in the table below where information on any SITs undertaken as part of the analysis of the policy options can be found in the evidence base. For guidance on how to complete each test, double-click on the link for the guidance provided by the relevant department.

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Does your policy option/proposal have an impact on…?	**Impact**	**Page ref within IA**
Statutory equality duties[3] Statutory Equality Duties Impact Test guidance	Yes/No	
Economic impacts		
Competition Competition Assessment Impact Test guidance	Yes/No	
Small firms Small Firms Impact Test guidance	Yes/No	
Environmental impacts		
Greenhouse gas assessment Greenhouse Gas Assessment Impact Test guidance	Yes/No	
Wider environmental issues Wider Environmental Issues Impact Test guidance	Yes/No	
Social impacts		
Health and well-being Health and Well-being Impact Test guidance	Yes/No	
Human rights Human Rights Impact Test guidance	Yes/No	
Justice system Justice Impact Test guidance	Yes/No	
Rural proofing Rural Proofing Impact Test guidance	Yes/No	
Sustainable development Sustainable Development Impact Test guidance	Yes/No	

[3] Race, disability and gender Impact assessments are statutory requirements for relevant policies. Equality statutory requirements will be expanded 2011, once the Equality Bill comes into force. Statutory equality duties part of the Equality Bill apply to GB only. The Toolkit provides advice on statutory equality duties for public authorities with a remit in Northern Ireland.

Summary: Analysis and Evidence

Policy Option 4

Description:

Introduce RED sustainability criteria for bioliquids in the RO in line with EU requirements.

PRICE BASE YEAR	PV BASE YEAR	TIME PERIOD YEARS	NET BENEFIT (PRESENT VALUE (PV)) (£M)		
			LOW: 82	HIGH: 150	BEST ESTIMATE: 240
	2010	27			

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	Optional		Optional	**-150**
High	Optional		Optional	**86**
Best Estimate				**-32**

Description and scale of key monetised costs by 'main affected groups'

This is the impact of introducing sustainability criteria in line with EU requirements on costs of meeting the RES. Sustainability standards could reduce the amount of liquid biomass in electricity generation, which would have to be replaced by other technologies to meet the RES 2020 target. Costs relate to resource costs excluding the cost of carbon for fossil fuel generation. Costs include estimated administration costs on biomass suppliers and operators.

Other key non-monetised costs by 'main affected groups'

The policy could lead to indirect land use changes which are not known. There could be indirect costs on the economy of increased electricity prices and bills but the scale of these is likely to be minimal.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional		Optional	**Optional**
High	Optional		Optional	**Optional**
Best Estimate				**208**

Description and scale of key monetised benefits by 'main affected groups'

Benefits consists of the value of higher GHG savings due to the introduction of GHG savings thresholds. GHG savings are estimated on a lifecycle basis.

Other key non-monetised benefits by 'main affected groups'

The direct GHG savings estimated here could lead to further benefits if indirect land use change effects of the policy are realised.

Key assumptions/sensitivities/risks **Discount rate (%)** 3.5

Key uncertainties concern the likely uptake of liquid biofuels in electricity generation. A smaller overall sector would result in reduced costs. Similarly, the availability of sustainably sourced feedstocks is uncertain. If constraints were less binding, the costs of sustainability standards would fall with higher availability of sustainable feedstocks. Other uncertainties relate to costs of renewable generation technologies, and future electricity and carbon prices.

IMPACT ON ADMIN BURDEN (AB) (£M):			IMPACT ON POLICY COST SAVINGS	IN SCOPE
NEW AB:	AB SAVINGS:	NET:	POLICY COST SAVINGS:	Yes/No

Enforcement, Implementation and Wider Impacts

What is the geographic coverage of the policy/option?			EU		
From what date will the policy be implemented?			01/04/2011		
Which organisation(s) will enforce the policy?			ofgem		
What is the annual change in enforcement cost (£m)?			n.a.		
Does enforcement comply with Hampton principles?			Yes		
Does implementation go beyond minimum EU requirements?			No		
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded:**	**Non-traded:**	
Does the proposal have an impact on competition?			No		
What proportion (%) of Total PV costs/benefits is directly attributable to primary legislation, if applicable?			**Costs:**	**Benefits:**	
Annual cost (£m) per organisation (excl. Transition) (Constant Price)	**Micro**	**< 20**	**Small**	**Medium**	**Large**
Are any of these organisations exempt?	No	No	No	No	No

Specific Impact Tests: Checklist

Set out in the table below where information on any SITs undertaken as part of the analysis of the policy options can be found in the evidence base. For guidance on how to complete each test, double-click on the link for the guidance provided by the relevant department.

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Does your policy option/proposal have an impact on…?	**Impact**	**Page ref within IA**
Statutory equality duties[4] Statutory Equality Duties Impact Test guidance	Yes/No	
Economic impacts		
Competition Competition Assessment Impact Test guidance	Yes/No	
Small firms Small Firms Impact Test guidance	Yes/No	
Environmental impacts		
Greenhouse gas assessment Greenhouse Gas Assessment Impact Test guidance	Yes/No	
Wider environmental issues Wider Environmental Issues Impact Test guidance	Yes/No	
Social impacts		
Health and well-being Health and Well-being Impact Test guidance	Yes/No	
Human rights Human Rights Impact Test guidance	Yes/No	
Justice system Justice Impact Test guidance	Yes/No	
Rural proofing Rural Proofing Impact Test guidance	Yes/No	
Sustainable development Sustainable Development Impact Test guidance	Yes/No	

[4] Race, disability and gender Impact assessments are statutory requirements for relevant policies. Equality statutory requirements will be expanded 2011, once the Equality Bill comes into force. Statutory equality duties part of the Equality Bill apply to GB only. The Toolkit provides advice on statutory equality duties for public authorities with a remit in Northern Ireland.

Evidence Base (for summary sheets) – Notes

Use this space to set out the relevant references, evidence, analysis and detailed narrative from which you have generated your policy options or proposal. Please fill in **References** section.

References

Include the links to relevant legislation and publications, such as public impact assessment of earlier stages (e.g. Consultation, Final, Enactment).

No.	Legislation or publication
1	EU Renewable Energy Directive – Promotion of the use of energy from renewable sources http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:en:PDF
2	EU Communication on the practical implementation of the EU biofuels and bioliquids sustainability scheme and counting rules for biofuels. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:160:0008:0016:EN:PDF
3	EU Summary of Impact Assessment sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling COM(2010) 11 Final http://ec.europa.eu/energy/renewables/transparency_platform/doc/2010_report/sec_2010_0066_1_impact_assesment_summary.pdf
4	E4Tech 'Biomass supply curves for the UK' 2009 http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/res/res.aspx
5	Biomass Environmental Assessment Tool (BEAT 2) http://www.biomassenergycentre.org.uk/portal/page?_pageid=74,153193&_dad=portal&_schema=PORTAL
6	UK RES 2009: Overall Impact Assessment http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/res/res.aspx

Evidence Base

Ensure that the information in this section provides clear evidence of the information provided in the summary pages of this form (recommended maximum of 30 pages). Complete the **Annual profile of monetised costs and benefits** (transition and recurring) below over the life of the preferred policy (use the spreadsheet attached if the period is longer than 10 years).

The spreadsheet also contains an emission changes table that you will need to fill in if your measure has an impact on greenhouse gas emissions.

Annual profile of monetised costs and benefits* - (£m) constant prices

	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9
Transition costs										
Annual recurring cost										
Total annual costs										
Transition benefits										
Annual recurring benefits										
Total annual benefits										

* For non-monetised benefits please see summary pages and main evidence base section

Microsoft Office Excel Worksheet

Evidence Base (for summary sheets)

Sustainability Standards for Solid and Gaseous Biomass used in the Electricity Sector

Problem under consideration

1. There are currently no mandatory sustainability criteria for solid biomass used in electricity generation. The EU has left the introduction of sustainability criteria for solid biomass to the discretion of each member state, with the EU only giving recommendations for potential criteria as outlined in their 25th February report (http://ec.europa.eu/energy/renewables/bioenergy/sustainability_criteria_en.htm). The lack of certainty over future sustainability standards creates additional risk for industry in sourcing fuel supplies and through releasing the necessary debt finance to develop biomass technologies needed for the UK to meet the 2020 renewable energy target. The lack of a sustainability scheme may also weaken public support for proposed new bioenergy plants both at a local and national level.

Rationale for intervention

2. The rationale for intervention relates to the UK climate change goals and the need to take urgent action against the damaging effects of global warming. Biomass electricity generation can play an important role in mitigating this impact, reducing carbon emissions and helping to meet the UK 2020 renewable energy target. Biomass is a finite resource so it is important to use it efficiently and sustainably. The particular market failure being addressed is that there are no provisions in place to ensure that the feedstocks used in this system deliver GHG savings on a life-cycle basis. Market failures may also occur because the potential negative impacts on biodiversity, water, and soils are not reflected in market prices. The proposed measures should ensure that GHG mitigation activities in the UK electricity market through biomass generation do not lead to carbon leakage elsewhere, and give industry greater certainty in making investment decisions.

3. By introducing sustainability criteria under the Renewables Obligation, rather than through the planning regime, we can apply these controls to existing as well as new power plants. Moreover, with the RO we have the benefit of an annual reporting regime, managed by the regulator Ofgem, and scheduled banding reviews every 4 years, which can allow us to reflect innovation and good practice in biomass sustainability. It also applies a consistent set of controls to biomass across the bioelectricity sector.

Policy Objective

4. The introduction of sustainability criteria in this area primarily aim to optimise GHG savings and prevent adverse land use change such as deforestation, thus ensuring biodiversity and other environmental benefits and goods are protected. Other important objectives are to ensure industry are given the certainty over investment conditions they need in order to meet the 2020 renewable energy targets, and to deliver the security of supply and green jobs benefits that these imply. The UK also aims to ensure that indirect adverse impacts are minimised – for example on global food supplies, indirect land use change – thus ensuring public support for the use of biomass in electricity generation.

Options considered

I. Do Nothing

5. Not introducing sustainability standards for solid biomass risks could lead to electricity generators using feedstocks from unsustainable sources that deliver little or no GHG savings on a life-cycle basis and have the potential for destructive impacts on land use through deforestation or other carbon sinks. As set out in our Coalition's Programme, http://programmeforgovernment.hmg.gov.uk/files/2010/05/coalition-programme.pdf , the Government believes that climate change is one of the gravest threats we face, and that urgent action at home and abroad is required. This driver, as well as the important role biomass is expected to play in meeting the 2020 RES target at an acceptable cost means that doing nothing is not an option.

II. Introduce sustainability scheme for Biomass and Biogas

6. The Renewable Energy Directive ("RED") sets mandatory sustainability criteria for bioliquids used for electricity and heat generation (and biofuels used for transport). However, the introduction of sustainability criteria for solid biomass and biogas is at the discretion of each member state, with the Commission only giving recommendations for potential criteria as outlined in their 25 February 2010 report: http://ec.europa.eu/energy/renewables/bioenergy/sustainability_criteria_en.htm. The Commission's main recommendation is that for simplicity and clarity, member states who choose to introduce sustainability criteria for biomass and biogas should use criteria similar to those mandated for bioliquids and biofuels.

7. Sustainability reporting for biomass was introduced into the RO in April 2009. The intention was to develop knowledge and expertise ahead of a potentially more rigorous, EU-wide sustainability scheme. The current RO sustainability reporting requires generators to submit an annual report on their biomass feedstocks, such as the country of origin and any land use change since November 2005, but does not set a minimum standard to be achieved. Ofgem are due to publish the first year of sustainable data in the summer. Introducing solid biomass and biogas sustainability criteria would provide certainty to industry around how the criteria would be applied in England and Wales.

8. In order to develop a sustainability scheme for biomass and biogas, the following elements of the scheme need to be considered:

   (i) The scope of the scheme in terms of production of biomass and which sources of biomass or biogas are covered

   (ii) Reporting requirements and whether the scheme should be voluntary or compulsory

   (iii) GHG savings performance criteria

   (iv) Coverage in terms of which end users are required to comply with the scheme.

   These are considered below.

Analysis of Options

(i) Scope of the Scheme in biomass production sources

9. The 2010 EU report on the requirement for sustainability criteria for solid and gaseous biomass recommends that the scope of the Scheme is similar to that mandated for bioliquids and biofuels:

- A restriction on the use of raw materials obtained from land with high biodiversity value, including primary forest, areas designated for nature protection purposes, and highly bio-diverse grasslands.

- A restriction on the use of raw material obtained from land with high carbon stock, such as from land that was peatland, in January 2008.

- Limited exceptions to the above restrictions on the use of raw materials as recognised by the RED in the sustainability criteria for bioliquids. For example, where it is shown that the harvesting of the raw material is necessary to preserve grassland status.

10. In addition the Commission recommends that use of waste is exempt from these sustainability criteria. This reflects both the routinely high greenhouse gas savings achieved and the challenge of setting default values for the wide range of possible waste feedstocks.

11. It is important to have consistency of application across the EU on these issues, not only because they protect areas of high carbon stock or biodiversity, but it gives bioenergy suppliers clear and consistent signals as to the sources that are excluded. If the UK chose to impose more or less stringent conditions this could impose higher costs to UK biomass generators if suppliers have to operate several different systems for sourcing and verification of products. It is not possible to quantify the likely extent of this.

(ii) Reporting requirements

12. As noted above, sustainability reporting was introduced in the RO in 2009, which required generators to verify the source of their biomass and to report on any land use change impacts. The proposal is to go further than this, in requiring operators to assess their lifecycle greenhouse gas emissions saving relative to fossil fuel, taking into account the energy conversion efficiency of their particular plant. In addition generators will be required to confirm to the regulator hat any materials other than wastes are not sourced from raw materials obtained from land important on carbon or biodiversity grounds

13. The EU has a Standard Cost Model to estimate the cost of chain of custody certification. This suggests a cost of between £700-2,500 per year for individual biomass producers. They suggest that when operators have to show actual GHG savings, costs could be 10%-20% higher, implying a cost of £70-£500 of GHG certification per operator compared with standard chain of custody certification.

14. The EU calculates that there will be higher operating costs for those involved in the bio-energy chain – processors, manufacturers, traders and producers of 60-70% compared with current reporting standards. Assuming this applies to UK biomass operators, would lead to additional costs of between £10,000 and £180,000 pa by 2020 depending on the level of generation and size of installation.

(iii) GHG savings performance criteria

15. The Commission recommends that Member States that have or who introduce sustainability schemes for solid and gaseous biomass ensure that these are as far as possible, in line with the criteria as laid down in the RED, which aims to ensure consistency and equal treatment across uses. Article 17(2) sets out the following criteria for biofuels and bioliquids:

    - Minimum GHG savings values of 35%, rising to 50% in 2017 and 60% from 2018 for installations in which production started on or after 1 January 2017.

16. The comparator against which the GHG savings are recommended to be measured is the EU-wide fossil fuel electricity (712.8 kgCO2 /MWh). This is a relatively high emissions factor when applied to the UK electricity sector. Average and marginal emissions factors for evaluation of policies to abate carbon in the UK electricity sector were published in July 2010. (http://www.decc.gov.uk/en/content/cms/statistics/analysts_group/analysts_group.aspx) This suggested average emission factors for the UK of 480kg/CO2/MWh in 2010 falling to 370kg/CO2/MWh in 2020, and a marginal emission factor of 393.9kg/CO2/MWh. The table below shows the EU recommended GHG emission savings when applied in the UK electricity market. The table shows that even the higher 60% threshold would only deliver lifecycle GHG savings of less than a third when compared with the marginal plant (gas CCGT) generation in the UK. A 35% threshold does not provide a benefit in the UK context and risks companies will manage down to the lowest common denominator.

Table 1: EU recommended minimum GHG emissions savings

	2010	**2017**	**2018**
Relative to EU comparator 712.8 kgCO2 /MWh	35%	50%	60%
Relative to UK marginal electricity emissions factor 393.9kg/CO2/MWh	-18%	10%	28%

Costs and Benefits

16. The starting point for estimating the impact of different sustainability thresholds in the UK electricity market is the analysis undertaken for the RES http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/res/res.aspx. In order to achieve the 2020 renewable energy target, the RES set out a lead scenario under which around bioenergy would contribute to about half of the effort. The modelling of the contribution that could be made in electricity was undertaken by Redpoint/Trilemma (2009) based on a study of available biomass supply by E4Tech (2009) op cit. The E4Tech(2009) study developed detailed supply curves and prices by feedstock that could be available in the UK up to 2030.

17. In order to model the impact of different sustainability criteria on the RES, it is necessary to estimate what impact different thresholds will have on available supply and/or prices. As the latter are highly uncertain and difficult to model, particularly where generators are operating in a global market with many drivers, it has not been possible to incorporate this in our analysis so far. This could have a significant impact on results and is something Government is working towards including in the final RIA.

18. In order to estimate the impact on potential biomass supply to the UK it is necessary to link E4Tech(2009) estimates of supply with information on their likely lifecycle emissions. The Environment Agency have published a tool – the BEAT model – which estimates GHG emissions on this basis for a number of feedstocks and applications. This information was used, together with different scenarios for the distribution of the GHG emissions, to estimate how much of individual feedstock types would pass different sustainability thresholds.

19. In developing their supply curve, the E4Tech(2009) report assumed that food needs were met first and that imports were likely to come from energy crops or forestry residues. Therefore the study limited the analysis to currently available land that is not used for

agriculture and excluded nature protected areas and carbon sinks. It could be the case that some feedstocks were grown on highly biodiverse land, which would be excluded under these criteria, but there is no information on which to base estimates of this.

20. In mapping the biomass feedstocks from this study with the BEAT model, we estimated the impact of applying the EU criteria to the modelling already undertaken for the RES. We also tested the impact of more stretching GHG thresholds – the modelled scenarios are set out below:

(i) GHG savings thresholds in line with EU recommendations (463kg C02/MWh falling to 285kg C02/MWh)

(ii) 60% GHG savings relative to the EU comparator - 285Kg C02/MWh (28% relative to UK marginal emissions)

(iii) 70% GHG savings relative to the EU comparator – 214kgC02/MWh (45% relative to UK marginal emissions)

21. As the tables below show, results are sensitive to the assumption made on which renewable technologies are deployed instead of biomass in order to ensure the RES target is reached. The analysis presents two assumptions: low estimates are based on additional onshore wind the high estimates are based on additional offshore wind. For the purposes of this cost benefit analysis we are taking into account the full lifecycle GHG emissions occurring anywhere on the globe[5]. Under the current UK accounting practice, burning of biomass, liquid or else, counts as zero carbon. Under that approach, introducing sustainability criteria would not result in a carbon saving as replacing even the 'worst' bioliquids by wind energy would not affect the carbon accounts.

2009 prices Positive values indicate as saving	In 2020			Cumulative to 2030		
	Onshore wind replaces biomass	Central estimates - Average of onshore and offshore	Offshore wind replaces biomass	Onshore wind replaces biomass	Central estimates - Average of onshore and offshore	Offshore wind replaces biomass
Option 1: GHG emissions saving thresholds in line with EU criteria (35% rising to 70% relative to EU-wide fossil electricity comparator)						
Resource cost £m	1	0	-1	25	-5	-35
Carbon benefit £m	0	0	0	30	30	30
NPV £m	1	0	-1	55	25	0
Option 2: 60% GHG savings threshold relative to EU comparator						
Resource cost £m	10	-5	-15	190	-50	-285
Carbon benefit £m	5	5	5	205	205	205
NPV £m	15	0	-12	395	155	-85
Option 3: 70% GHG savings threshold relative to EU comparator						
Resource cost £m	30	-10	-45	520	-130	-780
Carbon benefit £m	10	10	10	490	490	490
NPV £m	40	5	-35	1010	360	-295

Note: Estimates rounded to nearest £1m or £5m as appropriate

[5] Valued at the IAG Carbon value for emissions in the traded sector.

22. The carbon savings above reflect the GHG savings from additional wind deployment replacing biomass that does not pass the sustainability thresholds. Carbon savings are up to 20mtC02 in the strictest case to 2030. Cost effectiveness estimates are given below in the central case.

Option 1: GHG emissions saving thresholds in line with EU criteria (35% rising to 70% relative to EU-wide fossil electricity comparator) : £4/tCO2

Option 2: 60% GHG savings threshold relative to EU comparator : £6/tC02

Option 3: 70% GHG savings threshold relative to EU comparator : £6/tC02

These are all below the traded cost of carbon therefore all measures are cost-effective.

Assumptions and Risks

23. In modelling the potential impact of the sustainability criteria it has been necessary to make a number of assumptions because of a lack of data and evidence for a full exposition of costs and benefits. This adds to the uncertainty surrounding any analysis of the impact of these criteria. The key issues that affect the uncertainty are discussed below.

24. The amount and source of biomass supply available to the UK up to 2020 is a key input parameter in the costing of this proposal. We used E4Tech(2009) as a starting point for this, though other studies show a range of potential supply in the future, therefore this is uncertain. The BEAT model on which we based the GHG profiles of the different feedstocks is also limited in its examination of imports – which are assumed to be derived from forestry products that would otherwise be treated as wastes or residues. This is likely to be an underestimate of the true LCA of all sources of imports to the UK. It will be important to widen the scope of this source of biomass in future assessments. In addition, the GHG pathways in the BEAT model are not all consistent with the default EU criteria, which could affect results. The results suggested that imposing GHG sustainability standards could reduce UK biomass supply by 0-10% in option 1 (increasing over time as the criteria become stricter),10% in option 2 and 22% in option 3 under current assumptions.

25. Removing the worst GHG performing sources of biomass improves overall global emissions on a lifecycle basis. The estimated impact of the EU criteria is lower than the other options partly because the criteria are less stringent and partly because they are on a sliding scale to 2017.

26. Another assumption that affects estimates is the amount of biomass generation forecast in the baseline. The estimates in the table above are in line with previous modelling for the RES. If the amount of actual biomass generation is higher or lower than this baseline then the impact of GHG sustainability criteria would change depending on the GHG emissions pathways of the feedstocks.

27. Other factors that affect the cost benefit calculations are: technology cost assumptions and electricity and carbon prices going forward, all of which are subject to uncertainty. The above estimates are based on central projections of these. The key fossil fuel and carbon price assumptions can be found here http://www.decc.gov.uk/en/content/cms/statistics/analysts_group/analysts_group.aspx

(iv) Coverage by end user

28. EU recommends that small-scale users of biomass (less than 1MWe capacity) be exempt from the sustainability standards. In the UK electricity market, this would exempt around

10% of the biomass schemes currently in planning. This would reduce the administrative burden on these operators by between £1,000 to £18,000 pa.

29. According to the UK Renewable Energy Planning database (RESTATS), as of May 2010, dedicated biomass power capacity of up to 1.66 GWe has been consented by Secretary of State and local planning authorities in England and Wales. Of this 1.66 GWE capacity, under 5MW comes from plants falling below a 1MW capacity threshold, representing under 1% of the dedicated biomass generating capacity and under 1% of the corresponding expected total biomass usage.

Indirect Impacts

30. Sustainability criteria on biomass in the UK or more generally across the EU could lead to indirect impacts which are difficult to value. These include benefits to bio-diversity, protection of areas of high carbon stock and/or nature reserves which, as well as safeguarding carbon sinks could have positive recreational or conservation benefits.

31. There could also be a range of indirect effects not captured above. It is also possible that demand for sustainable biomass could displace agricultural production onto uncultivated areas with impacts on food prices, biodiversity and land use change impacts. Such indirect impacts are very difficult to model due to the complex nature of agricultural markets, the uncertainties involved in assessing the cause and effect interactions and pathways, and the difficulties in projecting to the future. Whilst the cost benefit analysis above assumes substitution away from biomass into other renewable technologies, risks on indirect land use change factors remain.

32. The security of supply impacts of the sustainability measures are likely to be minimal. The move towards more wind generation could lead to more intermittent supplies, but this needs to be balanced against the gains from more sustainable biomass supplies. The measures could also impact on employment – for example in biomass related services - but the effects are likely to be small.

Summary of preferred option with description of implementation plan

33. The preferred option is to set the minimum GHG threshold at 60% relative to the EU-wide fossil fuel comparator, and to apply the criteria to all power generating plants of 1MW and above. This would ensure that the growth in biomass heat and electricity delivers significant carbon savings at the same time as making a significant contribution to achieving the UK's target of 15% renewable energy by 2020 and increasing our energy security. At the same time it would limit the impact on smaller generators and small feedstock producers, who would struggle to engage with a complex sustainability scheme which could have a disproportionate impact on their costs.

34. These criteria would be introduced via the Renewables Obligation legislation for April 2011, and formally linked to eligibility for financial support from April 2013. This would allow for a phased introduction where generators and feedstock producers will have a year of reporting to familiarise themselves with the new system. Government and the regulator will then have an opportunity to resolve any teething problems highlighted within the first set of reports due by 31 May 2012.

Sustainability Standards for Bioliquids used in Electricity Generation

Problem under consideration

35. The Renewable Energy Directive requires that electricity generated from bioliquids must meet the mandatory sustainability criteria as set out in Article 17 & 18 of the Directive in order to measure compliance with renewable energy obligations, such as the RO, or to count towards the renewable energy target

Rationale for intervention

36. In order to address the problem posed by climate change, the UK has set stretching targets for a reduction in carbon emissions to 2050, and has a binding target to achieve 15% renewable energy by 2020. Biofuels and bioliquids can play an important role in this, but there is a need to ensure they deliver real benefits in terms of GHG emissions reductions and do not lead to carbon leakage elsewhere, or other damaging impacts on the environment or society.

Policy objective

37. The objectives of the policy are to ensure that the RED sustainability criteria are successfully implemented, that the use of bioliquids in electricity generation lead to substantial lifecycle GHG emissions reductions; that they do not lead to adverse impacts on land use change in the UK or abroad.

Options considered

(i) Do nothing;
(ii) Introduce sustainability criteria for bioliquids that are RED compliant.

Costs and Benefits

Do nothing

38. Doing nothing would mean that the UK was in breach of the RED Directive and would lead to infraction proceedings by the EU. There would be an increased risk of supporting electricity generation from bioliquids which are not sustainable. Not implementing sustainability standards would also carry a reputational risk for the bioliquid sector, possibly resulting in additional barriers to its development.

Introduce sustainability criteria for bioliquids that are RED compliant

39. In order to be RED compliant, bioliquids used in the electricity sector must demonstrate lifecycle GHG savings of:

(a) 35% from the introduction of the criteria, unless produced in an installation in operation on 23 January 2008 when it will start from 1 April 2013
(b) 50% from 1 January 2017 and
(c) 60% from 1 January 2018 where produced in installations in which production started on or after 1 January 2017.

40. For bioliquids the savings are applied on an input basis and apply against reference values of 91 gCO_2/MJ for bioliquids used in electricity generation and 77 g CO_2/MJ for use in heat, set out in Annex V(C).19. The table summarises the implied maximum carbon intensity under the proposed sustainability standards.

gr. CO_2/MJ	35%	50%	60%
Electricity	59.15	45.5	36.4
Heat	50.05	38.5	30.8

41. There are further provisions to prevent: conversion of land with a high biodiversity value (e.g. primary forests, grassland); or change the status of land with high carbon stock (forest and wetlands); or drain peatlands. (Bioliquids from wastes and residues other

than those derived from agriculture, forestry, aquaculture and fisheries, are excluded from these provisions).

42. The RED also requires that Member States cannot refuse to take into account on other sustainability grounds bioliquids which comply with the criteria. We are therefore extending the RO to Biodiesel made partly from fossil fuel.

Costs and Benefits

43. In order to estimate costs and benefits of the proposed criteria, it is necessary to first estimate the potential level of generation and costs with bioliquids in the absence of the sustainability criteria and compare this with the costs associated with generation once the criteria are implemented. As bioliquids are a relatively small source of renewable generation, they were not modelled explicitly in the RES, but are part of a wider group of 'other renewable' technologies modelled by Redpoint/Trilemma (2009). The imposition of sustainability criteria could impact on the supply of sustainable bioliquids and/or price. If the amount of generation from bioliquids is reduced under the sustainability criteria, then it is assumed that the gap would need to be filled by other renewable technologies in order to ensure the overall RES target is still met.

44. It should be noted that this baseline is not equivalent to a 'do nothing' scenario. Without the introduction of the sustainability standards, it would breach the directive to provide financial support to electricity generators for the consumption of bioliquids or indeed count their deployment towards the EU renewables targets. It is unlikely that any installation would come on stream in the absence of such incentives. This baseline is therefore a purely hypothetical construct representing the continuation of current policies ('business as usual', BAU), even though this is not an available option.

Baseline capacity and generation from bioliquids

45. In a baseline scenario, renewable generation from bioliquids could potentially come from three sources:

a) Cofiring
Until recently, most bioliquids used within the RO were cofired. Ofgem data on recent levels of bioliquid generation was used to estimate a deployment from this source to 2020. The analysis assumed typical values for the energy contents of the various feedstocks and a generating efficiency of 35%. Due to the lack of forecasts for the sector, we assume a flat profile to 2020 and no change in the proportion of feedstock (Residues (70%), Tall Oil (10%) and Tallow (20%)). Under these assumptions, a total of 276 GWh per annum would be generated from co-fired liquid biomass.

b) Dedicated Bioliquids
Dedicated bioliquids installations which have recently received or are currently going through planning permission have total capacity of 187MW. Installations accounting for 90% of this capacity are naming virgin vegetable oils (mainly palm and some rape seed) as their main feedstock. This would give a total generation in 2020 of 1,300 GWh.

c) Converted Oil fired stations
Due to more stringent air pollutant regulations under the Large Combustion Plant Directive[6], oil fired electricity stations will have to close in 2015. Converting such plants to the use of bioliquids might offer a way of using such installations further.

[6] http://europa.eu/legislation_summaries/environment/air_pollution/l28028_en.htm

If stations younger than 30 years would be converted, a total capacity of 176 MW (by 2020) or approx 2,000 GWh in 2020.

It has been shown in trials that palm oil is a suitable substitute for oil. We do not have any evidence on what would be the most likely feedstock for converted oil fired stations. We are therefore assuming converted oil fired stations to use the same feedstock mix as dedicated plants (mainly palm oil with some rape). However, in order to continue operating an existing station in this way, a plant would need to obtain a new permission under the IPPC. It is not certain this would be possible.

46. In the absence of better data, we are using this evidence to inform the potential uptake of liquid biomass. It should be borne in mind that not all of the installations in the planning process will be realised. Similarly additional proposals are likely come forward in the coming years. We are looking to improve our evidence base concerning the likely size of the industry in the future. In the absence of further data, we base the analysis in this assessment on the limited evidence presented above.

47. Given the uncertainties in accurately predicting how much of these might come forward under current policy, the above sources have been used to produce a range of potential generation under the baseline. The lower, central and high estimate of generating capacity and annual generation by 2020 are given in the table below;

	Capacity (MWe)	2020 Generation (GWh)
low	40	275
Central	230	1,500
High	400	2,750

48. The ranges are not meant to imply that in the ‘central’ case no oil fired power station is being converted and all dedicated installations go ahead. The potential technologies are rather likely to co-exist across the whole range represented here (in varying weights).

49. Similarly there is no or little evidence of the potential impact on the electricity generating sector of allowing FAME into the RO. FAME could arguably enable a faster expansion particularly at small scale end. As the baseline, however, is representing a BAU scenario and FAME is currently not supported through the RO, no uptake is explicitly assumed.

50. The current analysis should be considered in the context of these limitations on data availability.

Costs

51. To estimate resource costs, the costs of generating electricity using bioliquids needs to be compared the most likely alternative method for generating it.

52. Preliminary estimates of technology costs were provided by the National Non Food Crop Centre (NNFCC).These estimates are summarised below:

	Efficiency to power	Total Efficiency	Capex (m£/MW)	Fixed Opex (£/MWe/year)	Opex (£/MW)
Steam cycle	43%	43%	0.6	37,671	1.37

Gas turbine	36%	36%	0.2	8,664	1.37
Reciprocating engine (CHP)	40%	80%	1.0	20,210	1.37

53. The dedicated bioliquids plants are modelled as reciprocating engines while for converted oil fired stations the steam cycle settings were used. Co-firing operating costs are taken from the steam cycle while only 40% of the capex is assumed as we have no evidence on the costs of adopting processes to allow for co-firing.

54. The Food and Agricultural Policy Research Institute (FAPRI)[7] has current and forecast prices for Palm oil and Rapeseed oil which have been converted into £/GWh shown in the following table (showing the prices for 2010/11). These feedstock costs have been added to the capital and other operating costs above.

£/MWh (2010/11)	Palm Oil	Rapeseed
Dedicated (40% efficiency)	£106	£141
Former Oil fired (43%)	£95	£131

55. For co-firing, the range of feedstocks used is wide and some of them will come at low or negative costs, some will have a market value. Based on anecdotal evidence that co-firing feedstock was about three times as expensive as burning coal, £56/MWh has been used.

56. The cost of generation is then compared to forecast wholesale electricity prices to calculate the net resource cost. The wholesale prices represent the marginal costs of generating the same amount of electricity from traditional (fossil) technologies. [8]

57. Subsidy costs relate to the amount of ROC support available to different technologies, and were estimated by multiplying with ROC multiple with a projection of ROC prices in line with the RES lead scenario in the RES strategy.

58. Following the same approach outlined above for solid biomass, the total annual administrative costs of meeting sustainability standards incurred by all generators and suppliers of bioliquids would be in the range of £15,000 and £120,000. These costs are not included in the resource cost calculations.

Benefits

59. The main benefit of the sustainability criteria is to limit the risk of environmental degradation through negative land use change, and to ensure that bioliquid feedstocks produce a significant net increase in carbon savings. For the purposes of the RED, the full lifecycle greenhouse gas emissions are to be taken into account and results presented below.

60. Carbon savings are valued in line with central estimates for carbon in the traded sector in the IAG guidance[9].

Option 2: Implement the RED sustainability criteria for bioliquids

http://www.fapri.iastate.edu/outlook/2010/
http://www.decc.gov.uk/en/content/cms/statistics/analysts_group/analysts_group.aspx
http://www.decc.gov.uk/en/content/cms/statistics/analysts_group/analysts_group.aspx

61. To estimate the potential impact of introducing sustainability standards on electricity generation from bioliquids, average values for CO_2/MJ for the main feedstocks are summarised in the following table.

Feedstock	CO_2/MJ
Pure Vegetable Oil - Rape	36
Palm Oil (process is not specified)	44.14
Palm Oil (methane capture at mill)	20.89

Source: Rape: Renewable Fuels Agency (www.renewablefuelsagency.gov.uk/page/guidance-v3)
Palm: E4Tech following the EC's methodology to derive typical values

62. These 'typical', average values for palm take account of transport to and refining within the EU but no onward transport to the generator. On this basis 'average' palm oil would just get through the 50% sustainability standard applying from 2017 assuming the generator is located close to the refinery and the port of import. It is likely, though, that not all generators would be able to demonstrate full lifecycle GHG emissions that are as low as these average figures for their feedstock. Other electricity generators may be able to improve their lifecycle greenhouse gas saving and provide actual values that are below those typical ones here. Similarly they might change their process, for example by using a waste feedstock.

63. Criteria that limit production on land with a high carbon stock or high biodiversity serve as additional constraints to feedstocks which are produced on agricultural land (such as vegetable oils).

64. These constraints are likely to somewhat limit the development of bioliquids within the RO. The amount of bioliquids that could be sourced sustainably in the future is uncertain. For the purposes of this IA, it is assumed that 50% of bioliquids installations (in the central baseline) would not come forward as a result. Co-firing mainly uses waste feedstocks which are exempt from the land based criteria and typically achieve high life cycle greenhouse gas savings. It is therefore assumed that a similar level of co-firing would continue.

65. The shortfall of renewable energy generated from dedicated or converted installations need to be met by an expansion of an alternative renewable technology. Wind energy (on or off shore) is arguably the only technology available for this as other renewable technologies are approaching their maximum build rate constraints.

66. Assuming all the shortfall to be met by on shore wind would result in a resource cost saving (the high NPV column below) while only expanding off shore wind would increase the total costs of generating renewable electricity (leading to a low NPV). The central case assumes an equal proportion of on and off shore wind to be deployed. It is further assumed that the life cycle emissions for wind technologies were negligible compared to that of bioenergy, so it is assumed to be zero-carbon.

67. The table below summarises the main costs and benefits of introducing the sustainability standards. It shows the present value of costs and benefits over the typical lifetime of the plants involved.

Summary of costs and benefits of introducing sustainability criteria for bioliquids.

Costs, Benefits and NPV, m£	High (replacement by on shore wind)	Central (replacement by mix)	Low (replacement by off shore wind)

	2020	lifetime	2020	lifetime	2020	lifetime
Costs (positive values represent savings)						
Resource Cost	8	150	0	32	-7	-86
Subsidy cost	9	154	-2	-39	-13	-232
Benefits						
Value of Carbon Savings, full lifecycle	8	208	8	208	8	208
NPV						
Accounting for full lifecycle GHG emissions	17	357	6	240	-5	122

68. Replacing electricity generation from bioliquids that do not pass the sustainability criteria with increased wind deployment leads to GHG emissions savings of 8mt CO_2 equivalent (lifetime). In the central case, this shift also saves resource costs; the carbon savings are achieved at a cost of -3.8£/tCO_2 and the policy is cost effective on carbon savings grounds.

Assumptions and Risks

69. As outlined above, the starting point for estimating the impacts of introducing sustainability standards for liquid biomass is forming a baseline view on how much electricity might be generated from bioliquids in the absence of the policy at what economic cost and involving how much GHG emissions savings compared to alternative technologies.

70. There are currently few operating plants generating electricity from liquid biomass. Similarly we are not aware of readily available projections of future uptake in the industry. The data we used are therefore highly speculative – especially the administrative burden could be higher if many more small scale operators were to enter the market. The policy itself obviously has an impact here: indeed unless sustainability standards are introduced, the UK will not be able to support bioliquids.

71. The availability of sustainably sourced feedstocks would be another way of estimating a potential size of the generating capacity. However, liquid biomass feedstocks are in direct competition with biofuels and to some degree with solid biomass, as well as other sectors, most notably food. Limited evidence exists estimating the amount of supply available to each of these sectors and at what prices.

72. Similarly the assumptions on the cost side (technology and feedstock) are subject to uncertainty. For example world market prices for palm oil might not be what operators effectively pay: the quality requirements for feedstock are likely to be less stringent than e.g. for palm oil used in the food industry. At the same time, additional costs such as transport are not included in this estimate.

73. We are working to improve the robustness of our assumptions: the NNFCC are working on a more in-depth review of technology costs while research into the supply and prices of biomass is under way, led by AEA technology.

Indirect Impacts

74. Many liquid feedstocks used to generate electricity and heat, such as oil seeds and waste oils, could be supplied to alternative markets such as food[10], and transport. Supplies of these feedstocks may be constrained, and a high diversion of liquid feedstocks into electricity generation may therefore effect our ability to meet the transport target.

75. The use of waste oils in electricity generation has the additional benefit of reducing the costs for disposal. This has not been estimated.

76. The generation of a UK market for bioliquids may generate additional employment if the production of the feedstock and processing is based in the UK and when additional jobs are required to build, service and maintain additional installations. These jobs are likely to substitute from other sectors so there may be no net increase

77. Additional environmental and social effects, both positive and negative, are likely to occur. These include effects on air, soil and water, food prices and indirect land use change. Indirect land use change occurs when an overall increase in demand for a feedstock displaces land which would otherwise be used for food, thereby causing additional conversion of land elsewhere. If the land converted was of high carbon stock, the net greenhouse gas emissions could be higher in the short term than burning the equivalent fossil fuel

78. None of these indirect impacts have been included in the estimated benefits above.

Summary and preferred option with description of implementation plan

79. The introduction of the sustainability criteria for liquid biomass is compulsory under the RED. While this is expected to increase the costs of meeting the 15% renewable energy target, it would also lead to higher global GG savings than under the hypothetical BAU.

Wider Impacts of both Biomass and Bioliquids

Competition Assessment

80. The same sets of sustainability criteria will apply equally to all bioliquid generators and to biomass generators of 1MW and above, so should not distort competition. It will instead encourage a more level playing field by setting an agreed market standard for 'sustainable biomass' and 'sustainable bioliquid' across the UK. Our smaller generators (1MW-25MW) will find it easier to source biomass that they can be confident is sustainable, whilst the smaller feedstock suppliers will find it easier to demonstrate that their biomass meets the sustainability needs of a much wider customer base.

Small firms impact test

81. Regarding biomass, by excluding generators below 1MW capacity from the full scheme, and only requiring factual reporting of sustainability data built on the existing RO requirements, we have limited any unwanted impacts on small firms. Nevertheless, the annual information supplied by small generators will allow Government to monitor the sustainability of the biomass they are using, and take action if necessary. For bioliquids, the costs estimated in the EU's impact assessment indicate that the administration costs on small firms will be modest.

[10] See for example the Gallagher review http://www.unido.org/fileadmin/user_media/UNIDO_Header_Site/Subsites/Green_Industry_Asia_Conference__Maanila_/GC13/Gallagher_Report.pdf

Sustainable Development

82. The addition of sustainability reporting requirements for the use of biomass in electricity generation, will ensure that the growth in biomass electricity also delivers strong carbon reductions and helps tackle dangerous climate change. In addition, the restrictions on use of materials that have been produced through negative land use change, will provide further protection for land important on carbon or biodiversity grounds.

Carbon Assessment

83. The value of carbon savings are included in the tables following paragraph 21 above. For the preferred option of 60% GHG emissions savings the value of carbon saved over a lifetime basis is £155M. For bioliquids the lifetime value is £240M.

Security of Supply

84. Dedicated biomass is 'dispatchable' so, unlike the majority of renewables, can be used to provide both base load and peak load power. This means that biomass electricity can perform a critical grid balancing role as larger amounts of intermittent power, such as onshore and offshore wind, comes online. However, growth in biomass electricity cannot take place without public support for new plants being built. Therefore, though the criteria will restrict generators to using sustainable biomass feedstocks in order to benefit from RO support, the net result on UK energy security is expected to be positive. Credible sustainable criteria will help support both an effective, timely planning process, and reduce the associated risks for developers and investors.

Environmental Impacts

85. Increased combustion of biomass will have implications for local air quality and will need to be addressed through suitable remedial actions, such as the application of filters or scrubbers within the plant design. This, and other local environmental impacts of new biomass plants, on local soil, water, air, land, biodiversity and amenities, will be considered within the existing planning and permitting processes. Regarding increased production of biomass feedstocks in the UK, we already have robust sustainable forestry management practices, and applications for an Energy Crops Grant are subject to an environmental appraisal and site visit.

Rural Proofing

86. A large proportion of biomass feedstocks are produced by the farming and forestry sectors. Therefore, increasing the proportion of energy from biomass is expected to mean some new business and job opportunities in rural areas as part of an expanding UK biomass supply chain. Although there has been no separate or explicit assessment of the needs of rural areas, these proposals are set within this wider policy context and aim to ensure that the impacts on consumers and their bills are reasonable. Biomass Sustainability policy is informed by the knowledge and expertise advisory bodies including the Renewables Advisory Board and the Biomass Sustainability Stakeholder Working Group (BSSWG). BSWWG includes rural business interests through the National Farmers Union (NFU) and Country Land & Business Association.

Annexes

Annex 1 should be used to set out the Post Implementation Review Plan as detailed below. Further annexes may be added to provide further information about non-monetary costs and benefits from Specific Impact Tests, if relevant to an overall understanding of policy options.

Annex 1: Post Implementation Review (PIR) Plan

A PIR should be undertaken, usually three to five years after implementation of the policy, but exceptionally a longer period may be more appropriate. A PIR should examine the extent to which the implemented regulations have achieved their objectives, assess their costs and benefits and identify whether they are having any unintended consequences. Please set out the PIR Plan as detailed below. If there is no plan to do a PIR please provide reasons below.

Basis of the review: The measures will be reviewed following the statutory consultation published alongside this IA.
Review objective: To take account of any new evidence and to ensure regulations are operating as expected.
Review approach and rationale: Evaluation of the annual data on sustainability of the feedstocks used, provided by generators to Ofgem, consultation responses and stakeholder feedback as well as consideration of the available new research on biomass availability, supply chain innovation and good practice to fill evidence gaps. Evaluation of consultation responses and stakeholder feedback as well as consideration of new research to fill evidence gaps.
Baseline: The current baseline is no sustainability criteria are introduced.
Success criteria: Success will be measured against (i) evidence on lifecycle GHG emissions of biomass and bioliquids used in the electricity sector and (ii) evidence on sources of these feedstocks.
Monitoring information arrangements: Data as above will be collected through the implementing authority on an annual basis. The effectiveness of this policy will be formally assessed as part of the banding reviews of the Renewables Obligation which are expected to be run every 4 years. The first review would therefore be scheduled to start in October 2014.
Reasons for not planning a PIR:

Add annexes here.