Title:	Impact Assessment (IA)
Amendments to the Renewable Transport Fuel Obligation for compliance with the Renewable Energy Directive - (3) Double Certification of Waste-Derived Biofuels	**IA No:** DFT00053
Lead department or agency: Department for Transport (DfT)	**Date:** 19/08/2011
Other departments or agencies:	**Stage:** Final
	Source of intervention: EU
	Type of measure: Secondary legislation
	Contact for enquiries: Craig Mills - 020 7944 4895 (craig.mills@dft.gsi.gov.uk)

Summary: Intervention and Options

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

Greenhouse gas (GHG) emissions from transport are significant and impose costs on others through their contribution to climate change; those costs are not taken into account by those that emit them. Using renewable energy can reduce GHG emissions and there are therefore EU and UK renewable energy targets. However, these are not likely to be met by the market alone, because of the extra cost of renewable energy compared to fossil fuels in the near term at least. The UK intends to meet its Renewable Energy Directive (RED) transport target through the Road Transport Fuel Obligation (RTFO). The problem under consideration in this Impact Assessment is how to further incentivise the supply of highly sustainable waste derived biofuels.

What are the policy objectives and the intended effects?

The policy aims to increase the use of highly sustainable waste-derived biofuels and encourage the development of advanced biofuel refining technologies in the transport sector. The objective of this policy is to provide an additional financial incentive for the supply of highly sustainable (non-food) biofuel derived from wastes, residues, non-food cellulosic material and ligno-cellulosic material as required by the Renewable Energy Directive. The intended effect is that these additional incentives are expected to increase the price obligated suppliers are willing to pay for these fuels, which should in turn lead to increased investment and an increase in the available supply of these fuels. We do not intend to implement this directive beyond the minimum requirements.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

The RTFO already exists to impose an obligation on fuel suppliers to supply biofuel. This impact assessment is the third in a set of five impact assessments considering amendments to the RTFO. The policy option considered here is to introduce a system of double certification for highly sustainable biofuel derived from wastes, residues, non-food cellulosic material and ligno-cellulosic material.

One option has been considered (against a "do nothing" baseline) in this impact assessment which is to reward each litre of highly sustainable biofuel with two Renewable Transport Fuel Certificates (RTFCs)

The preferred option is to allow the double reward of highly sustainable biofuels as it is expected to increase the supply of highly sustainable biofuel.

Will the policy be reviewed? It will be reviewed. **If applicable, set review date:** 4/2014	
What is the basis for this review? Duty to review. **If applicable, set sunset clause date:** Month/Year	
Are there arrangements in place that will allow a systematic collection of monitoring information for future policy review?	Yes

Ministerial Sign-off For final proposal stage Impact Assessments:

I have read the Impact Assessment and I am satisfied that (a) it represents a fair and reasonable view of the expected costs, benefits and impact of the policy, and (b) the benefits justify the costs.

Signed by the responsible Minister: Norman Baker Date: 19 October 2011

Summary: Analysis and Evidence

Policy Option 1

Description:

Implement double certification of waste-derived biofuel in line with requirements of Renewable Energy Directive.

Price Base Year 2010	PV Base Year 2011	Time Period Years 18	Net Benefit (Present Value (PV)) (£m)		
			Low: 62.2	**High:** -17.7	**Best Estimate: 61.7**

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	NA		NA	**NA**
High	NA		NA	**NA**
Best Estimate	NA		NA	**NA**

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

Introduction of double certification is not expected to result in additional costs as suppliers obligated under the RTFO (who are assumed to be cost minimisng) will be able to meet their obligation using the same mix of fuels as they would in the baseline (i.e. the RTFO with no double counting). The costs of meeting the RTFO may fall as a result of double certification but it is not possible to quantify any such decline in costs.

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

Lower demand for crop-derived biofuel, as a result of double certification of waste-derived biofuel, may lead to lower profitability for the producers of those biofuels. Higher demand for waste feedstocks (i.e. used cooking oil, tallow, municipal waste, wood chips, waste wood) may push up prices for these inputs, which may have a negative impact on the profitability of other industrial users.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	NA		NA	**62.2**
High	NA		NA	**-17.7**
Best Estimate	NA		NA	**61.7**

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

Under the central scenario, increased GHG savings resulting from increased supply of high GHG saving biofuels are estimated to produce monetised GHG savings benefits of £61.7m over the period 2012 to 2030. This sits within the sensitivity range owing to the very significant uncertainties around the volume and characteristics of potential fuel mixes.

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

The policy may increase investment and innovation in the production of advanced biofuels as this will become more profitable. Increased profitability for producers of these fuels is therefore likely, but this is not possible to quantify. The relative increase in GHG savings may be underestimated as potential GHG emissions from indirect land use change have not been taken into account in the calculations.

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

The GHG savings per litre of fuel are taken from Renewable Fuels Agency (RFA) data and the Renewable Energy Directive (annex V). The relative GHG savings are subject to significant uncertainty as they vary across types of fuels. GHG savings are valued at the non-traded carbon price for emissions in agriculture and the traded carbon price for other emissions in biofuel production, taken from central DECC guidance. The UK supply of waste-derived biofuels in the baseline is assumed to reduce to near-zero from 2011 when other EU member states when introduce double certification in line with RED thus making the supply of waste-derived biofuel significantly more profitable in these countries.

Direct impact on business (Equivalent Annual) £m):			In scope of OIOO?	Measure qualifies as
Costs: NA	**Benefits:** NA	**Net:** NA	No	NA

Enforcement, Implementation and Wider Impacts

What is the geographic coverage of the policy/option?			United Kingdom		
From what date will the policy be implemented?			15/12/2011		
Which organisation(s) will enforce the policy?			DfT		
What is the annual change in enforcement cost (£m)?			0		
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:** 0.21	**Non-traded:** 1.29	
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:** n/a	**Benefits:** n/a	
Distribution of annual cost (%) by organisation size (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.

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	No	
Economic impacts		
Competition Competition Assessment Impact Test guidance	Yes	20
Small firms Small Firms Impact Test guidance	Yes	21
Environmental impacts		
Greenhouse gas assessment Greenhouse Gas Assessment Impact Test guidance	No	14
Wider environmental issues Wider Environmental Issues Impact Test guidance	No	
Social impacts		
Health and well-being Health and Well-being Impact Test guidance	No	
Human rights Human Rights Impact Test guidance	No	
Justice system Justice Impact Test guidance	No	
Rural proofing Rural Proofing Impact Test guidance	No	21
Sustainable development Sustainable Development Impact Test guidance	No	21

[1] Public bodies including Whitehall departments are required to consider the impact of their policies and measures on race, disability and gender. It is intended to extend this consideration requirement under the Equality Act 2010 to cover age, sexual orientation, religion or belief and gender reassignment from April 2011 (to Great Britain 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 assessments of earlier stages (e.g. Consultation, Final, Enactment) and those of the matching IN or OUTs measures.

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	RTFC market price data http://www.nfpas-auctions.co.uk/etoc/trackrecord.html
3	EU Fuel Quality Directive: http://ec.europa.eu/environment/air/transport/fuel.htm
4	DECC IAG Carbon Prices (Table 3): http://www.decc.gov.uk/assets/decc/Statistics/analysis_group/81-iag-toolkit-tables-1-29.xls
5	NNFCC advanced biofuels research (currently unpublished – soon to be published on DfT website)
6	The Renewable Transport Fuel Obligations Orderhttp://www.legislation.gov.uk/uksi/2007/3072/contents/made

+ Add another row

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)

Introduction

1. Transposition of the EU Renewable Energy Directive (RED) into UK law means that changes are required to the current biofuels obligations in order for the UK to be compliant.

2. This Impact Assessment is one of five final stage impact assessments related to transposition of the RED. It focuses on one particular aspect of the RED: double certification of waste-derived biofuels and biofuels derived from residues, non-food cellulosic material, and ligno-cellulosic material[1].

3. The suite of 5 impact assessments is:
   i) Mandatory Sustainability Criteria
   ii) Reporting & Verification
   iii) Double-Certification of Waste-Derived Biofuels
   iv) Partially Renewable Fuels
   v) Overarching Impacts

4. This impact assessment examines the costs and benefits of implementing double-certification of waste-derived biofuels, as prescribed by the RED.

5. There are significant uncertainties in the analysis presented, not only because of the future timeframe considered (to 2030[2]) but also because of uncertainties in the underlying costs, benefits, GHG[3] savings etc.

6. The structure of this IA is as follows: it will set out the problem under consideration and the rationale for government intervention, before then explicitly stating the policy objectives of this intervention. The policy option is described and the methodology for analysing the costs and benefits of the policy option is explained, including the key assumptions and areas of uncertainty. Wider impacts and relevant specific impact tests are described in the annex. The impact assessment concludes by describing the preferred option.

Consultation Exercise

7. This final stage impact assessment follows a public consultation exercise carried out by the Department for Transport. Interested parties were invited to comment on the policy options and underlying analysis either at public meetings (2 of which were held) or through written responses.

8. Stakeholders expressed concern that the introduction of double certification would shrink the UK market for crop derived biofuel. This policy impact was covered qualitatively in the

[1] For simplicity waste-derived biofuels and biofuels derived from residues, non-food cellulosic material, and ligno-cellulosic material are collectively referred to as waste derived biofuels throughout the rest of the document.

[2] The analysis has been conducted out to 2030 as this is the length of time judged necessary to drive long term infrastructure investment needed to deliver biofuels target. In its current form, the RTFO is due to continue indefinitely.

[3] greenhouse gas

consultation stage impact assessment. In this final stage impact assessment further quantitative analysis has been undertaken in the supply scenarios.

9. Stakeholders also requested more detailed analysis of the potential for biofuels from advanced processes to be included. Recent research on this area has now been included in the analysis.

10. It was also highlighted that the implementation of double certification in other EU Member States would likely lead to lower levels of imports from these countries. This has now been explicitly captured in the analysis.

11. Since the consultation, further RTFO supply data has become available which has been used to inform a new set of uptake scenarios which underpin the analysis in this IA.

Problem under consideration

12. At present, all renewable fuels supplied to the road transport sector are treated equally under the UK's Renewable Transport Fuel Obligation (RTFO) and count towards the obligation on a volume basis (i.e. one certificate is awarded for each litre of biofuel supplied). This approach does not therefore provide any additional incentive to supply highly sustainable biofuels.

13. Waste-derived biofuel is thought to be highly sustainable. It does not compete directly with food crops and is estimated to deliver high GHG savings. Waste derived biofuel is also thought less likely to lead to GHG emissions from indirect land use change (ILUC). It is therefore desirable to increase the supply of highly sustainable biofuels over and above what would be supplied under the current incentives framework (the unamended RTFO) which treats all biofuels equally.

Policy objective

14. The objective of this policy is to provide additional incentives for these more sustainable fuels to be supplied. The intended effect is that these incentives are expected to increase the price obligated suppliers are willing to pay for these fuels, which in turn should lead to an increase in the available supply.

Rationale for intervention

15. The EU Renewable Energy Directive (RED) requires biofuels that are derived from wastes, residues, non-food cellulosic material, and ligno-cellulosic material inputs to be counted twice towards compliance with any national renewable energy obligation (i.e. in the RTFO in the UK) and the 10% RED transport target, thus providing an increased incentive to supply these types of fuels. To ensure that the RTFO is compliant with the RED, an amendment is therefore required. Implementing this requirement in the RTFO — through the issuance of two, rather than one, certificates for each litre supplied — would

demonstrate compliance with the RED, as well as encouraging additional highly sustainable biofuels to be supplied in the UK.

16. Implementing double counting would increase obligated suppliers' willingness to pay for highly sustainable biofuel, increasing the market price and stimulating investment in increased supply. Failure to implement double counting is expected to result in significant volumes of highly sustainable biofuel which is currently supplied in the UK (and often sourced from overseas) being diverted to other EU Member States which have a higher willingness to pay as they have implemented double counting. Failure to implement double counting may also result in infraction proceedings being brought against the UK.

Description of options considered (including do nothing)

17. Given the RTFO is already in place, there is the option to make an amendment to ensure that it is compliant with the RED and recognises the benefits delivered by waste-derived biofuels. The costs, benefits and impacts on the market of this option will be explored in this section.

Baseline (doing nothing)

18. In the following cost benefit analysis, the costs and benefits of implementing double certification have been assessed against a 'do nothing' baseline. Doing nothing entails leaving the RTFO unamended and continuing to issue only one certificate for each litre of waste-derived biofuel supplied. This option leads to no additional costs or benefits.

19. In the baseline, it is estimated that the UK supply of waste-derived biofuel falls to almost zero in 2012. This is because other EU Member States are expected to implement double certification, as required by the RED, in this year. If the UK did not implement double certification, and other Member States did, then there would be double the incentive to supply the UK's current supply of waste-derived biofuel (which is currently largely sourced from abroad) to other Member States. As waste-derived biofuel is a globally traded commodity, it is expected that the supply will flow to the market where willingness to pay (and therefore the financial return for producers) is highest. Figure 1 shows the projected baseline RTFO fuel mix going out to 2020.

Figure 1: Projected baseline RTFO fuel mix (2012 to 2030)

	biodiesel	ethanol	UCO	Tallow	biomethane	Second generation ethanol	Second generation biodiesel
2012	1004	1141	0	0	0	0	0
2013	1092	1283	0	0	0	0	0
2014	1071	1304	0	0	0	0	0
2015	1043	1316	0	0	0	0	0
2016	1020	1328	0	0	0	0	0
2017	1001	1339	0	0	0	0	0
2018	984	1349	0	0	0	0	0
2019	969	1359	0	0	0	0	0
2020	956	1368	0	0	0	0	0
2021	946	1376	0	0	0	0	0

2022	937	1383	0	0	0	0	0
2023	929	1391	0	0	0	0	0
2024	923	1398	0	0	0	0	0
2025	919	1406	0	0	0	0	0
2026	913	1412	0	0	0	0	0
2027	906	1418	0	0	0	0	0
2028	899	1424	0	0	0	0	0
2029	892	1430	0	0	0	0	0
2030	885	1436	0	0	0	0	0

Costs and benefits of introducing double certification of waste-derived biofuel

20. This section sets out the approach that has been used to assess the estimated costs and benefits of the option outlined above, relative to the baseline. It will set out:

    - the context in terms of what this option might mean in practice;
    - the methodology used to produce supply scenarios;
    - the methodology used to assess the costs and benefits of the changes under consideration;
    - summary and conclusion of the preferred option.

Context

RTFO Market Impact

21. Implementing double certification will mean that certain types of biofuel will count twice towards fuel suppliers' obligations under the RTFO. The fuels considered eligible for double counting in the following analysis are:

    - Used cooking oil (UCO)-derived biodiesel
    - Tallow-derived biodiesel
    - Waste-derived biomethane
    - Bioethanol from advanced processes (second generation "2G" bioethanol)
    - Biodiesel from advanced processes (second geration "2G" biodiesel)

22. To meet a given obligation level, the introduction of double certification will mean that for each additional litre of waste-derived biofuel supplied two litres of conventional biofuel will be displaced from the overall supply.

$$Obligation\ level\ (litres) = conventional\_biofuel\ (litres) + 2 \times waste\_biofuel\ (litres)$$

23. Therefore, an obligated supplier will value supplying one litre of waste-derived biofuel as the equivalent of supplying two litres of conventional crop-derived biofuel. This will effectively increase suppliers' willingness to pay for waste-derived biofuel (by the value of a certificate), driving up prices and in turn providing the additional incentive for the market to increase its supply. To date the average traded value of a certificate has been £0.17 per certificate with a range of £0.09 to £0.24 per certificate.

24. Implementing double certification of waste-derived biofuel, whilst holding the overall obligation level constant, will however decrease the absolute volume of biofuel supplied under the RTFO, as two litres of crop-derived biofuel will be displaced for each litre of waste-derived biofuel supplied.

Historical Supply

25. Under the RTFO to date, used cooking oil (UCO)-derived biodiesel, tallow-derived biodiesel and biomethane have been supplied. Historical supply data are set out in figure 2. No biofuels from advanced processes have been supplied. Full year data is available for obligation years 08/09 and 09/10. Data from the first 9 months of obligation year 11/12 has been pro-rated for ease of comparison.

Figure 2: Historical RTFO supply data for tallow, UCO and biomethane

Tallow (litres)

	08/09	**09/10**	**10/11 (pro-rated)**
UK	5,156,672	40,032,147	27,005,464
EU	5,220,474	50,376,553	26,691,997
RoW	96,070,974	65,347,536	15,352,395
Unknown	8,737,367	26,552,035	1,223,795
Total	115,185,487	182,308,271	70,273,651

UCO (litres)

	08/09	**09/10**	**10/11 (pro-rated)**
UK	35,921,395	29,809,440	98,329,331
EU	2,169,647	7,130,141	268,714,771
RoW		273,638	35,292,160
Unknown	1,431,380	5,912,516	16,962,277
Total	39,522,422	43,125,735	419,298,539

Biomethane (kg)

	08/09	**09/10**	**10/11 (pro-rated)**
UK	415,700	195,797	435,401

26. In the first two years of the RTFO, tallow was the most prevalent waste-derived biofuel supplied, accounting for around 74% of waste-derived biofuel supplied in the first year of the RTFO and 81% in the second. In the third year, it formed only 14% of the supply. Conversely, used cooking oil-derived biodiesel constituted 25% in the first year, 19% in the second year and 86% in the third year. The reason for the upsurge in the UCO supply was the introduction of a 20ppl (pence per litre) duty differential in April 2010 (which will expire in April 2012) which has created an additional incentive to supply UCO-derived biodiesel. Between 09/10 and 10/11, the UCO-derived biodiesel supply jumped by almost 1000%. This increase was driven primarily by imports from other EU Member States (which grew by 3800%) and also a large increase in UK sourced UCO (which grew by 330%). Since the introduction of the RTFO the biomethane supply has been relatively small, accounting for les than 0.5% of the waste-derived biofuel supply in any given year. No biodiesel or bioethanol from advanced processes has been supplied under the RTFO to date.

Methodology – Supply scenarios (under Double Certification)

27. The future supply of waste-derived biofuel under double certification is highly uncertain. This uncertainty derives from a number of factors including: (1) a lack of clarity on the potential global availability of feedstocks, (2) the potential global capacity to process the feedstocks, (3) the future technical development and availability of advanced processes (which are not mature technologies) (4) the level of competing demand for waste-derived biofuel from other EU Member States.

28. To reflect this uncertainty, three potential supply trajectories have been modelled. Supply scenarios have been developed using historical supply data, supply potential assumptions developed by AEA technology (see annex 6) and advanced processes scenarios developed by the National Non Food Crop Centre (see annex 7).

29. In response to the consultation, a number of comments were received with regard to double certification which have been taken into account, as far as is possible in the following analysis. Stakeholders highlighted recent (obligation year 10/11) supply data (following the introduction of the 20ppl duty differential for UCO-derived biodiesel) which could be taken into account. Another noted that implementation of double certification across the EU would diminish the incentive for cross border trading of these fuels. No actual numbers on projected supply volumes were received from consultation respondents.

Central Supply Scenario

30. Under the central scenario, the overall RTFO supply of UCO derived-biodiesel is expected to fall significantly in 2012. This is because imports from other EU Member States (which form the majority of the reported 10/11 supply) are expected to fall to almost zero as financial incentives are equalised across all EU Member States (i.e. all Member States introduce double certification removing the incentive for significant volumes of cross-border trading). Production of UK-sourced biodiesel is projected to remain at 10/11 volumes (which are already elevated due to the impact of the duty differential) in 2012 and then grow gradually to 161 million litres (100% of identified potential – AEA central scenario) by 2020. Imports from the rest of the world are estimated to stay constant at (already elevated) 10/11 volumes.

31. Under the central scenario, the overall RTFO supply of tallow-derived biodiesel is expected to increase significantly in 2012. The UK sourced supply of tallow is projected to jump to 202 million litres in 2012 (75% supply of identified potential - AEA central scenario) and then grow gradually to 270 million litres (100% of identified potential) by 2020. The initial sudden jump in supply (rather than a gradual increase) is expected as tallow is currently traded and is readily available. EU imports are assumed to fall to almost zero as incentives are equalised across Member States. Imports from the rest of the world are assumed to increase to 130 million litres (double the 08/09 level) and to remain at this level thereafter. The supply from the rest of the world is expected to increase (in spite of competing demand from other EU Member States) due to the scale of the global meat processing industry and therefore tallow production.

32. The supply of biomethane is projected to remain at current supply levels. The reason this level is not forecast to increase is because alternative financial incentives i.e. the Renewable Heat Incentive) offer a higher price for biomethane. Therefore new biomethane capacity is assumed to be used for grid injection rather than transport uses.

33. The supply of bioethanol from advanced processes is projected to increase from zero to 189 million litres from 2015. The supply of biodiesel from advanced processes is projected to provide the remainder of biodiesel from 2015 onwards.

34. The crop-derived biodiesel supply is estimated to fall from 309 million litres to zero in 2020. The Crop-derived bioethanol supply is estimated to drop from around a billion litres to 666 million litres as 2G bioethanol capacity comes online in 2015.

Figure 3: Projected RTFO fuel mix under the central scenario (million litres/kg)

	biodiesel	ethanol	UCO	Tallow	biomethane	2G ethanol	2G biodiesel
2012	309	1004	151	265	0.4		
2013	401	1092	158	282	0.4		
2014	374	1071	166	299	0.4		
2015	336	666	174	316	0.4	189	
2016	298	643	182	333	0.4	189	
2017	260	623	190	349	0.4	189	
2018	221	606	198	366	0.4	189	
2019	181	591	205	383	0.4	189	
2020	0	579	213	400	0.4	189	70
2021	0	568	213	400	0.4	189	74
2022	0	559	213	400	0.4	189	78
2023	0	552	213	400	0.4	189	82
2024	0	546	213	400	0.4	189	85
2025	0	542	213	400	0.4	189	89
2026	0	535	213	400	0.4	189	92
2027	0	528	213	400	0.4	189	95
2028	0	521	213	400	0.4	189	98
2029	0	514	213	400	0.4	189	101
2030	0	507	213	400	0.4	189	104

low supply scenario

35. The low scenario reflects comments from consultation respondents which suggest that increased competition from EU Member States will reduce the potential supply of waste feedstocks available to UK suppliers and also that the incentive from double certification may not match the incentive for UCO relative to duty differential (leading to a fall in supply). In the low scenario, the supply of tallow-derived biodiesel, UCO-derived biodiesel and biomethane is projected to be half the level seen of the central scenario. There is no biodiesel or bioethanol from advanced processes in the low scenario (which could result from a slow rate of technological progress). In the low scenario supplies of 1G crop-derived bioethanol and biodiesel remain at relatively high levels.

Figure 4: Projected RTFO fuel mix under the low scenario (million litres/kg)

	biodiesel	ethanol	UCO	Tallow	biomethane

2012	725	1004	75	133	0.2
2013	842	1092	79	141	0.2
2014	839	1071	83	149	0.2
2015	826	1043	87	158	0.2
2016	813	1020	91	166	0.2
2017	800	1001	95	175	0.2
2018	785	984	99	183	0.2
2019	770	969	103	192	0.2
2020	754	956	107	200	0.2
2021	762	946	107	200	0.2
2022	770	937	107	200	0.2
2023	777	929	107	200	0.2
2024	784	923	107	200	0.2
2025	792	919	107	200	0.2
2026	798	913	107	200	0.2
2027	804	906	107	200	0.2
2028	810	899	107	200	0.2
2029	817	892	107	200	0.2
2030	823	885	107	200	0.2

high supply scenario

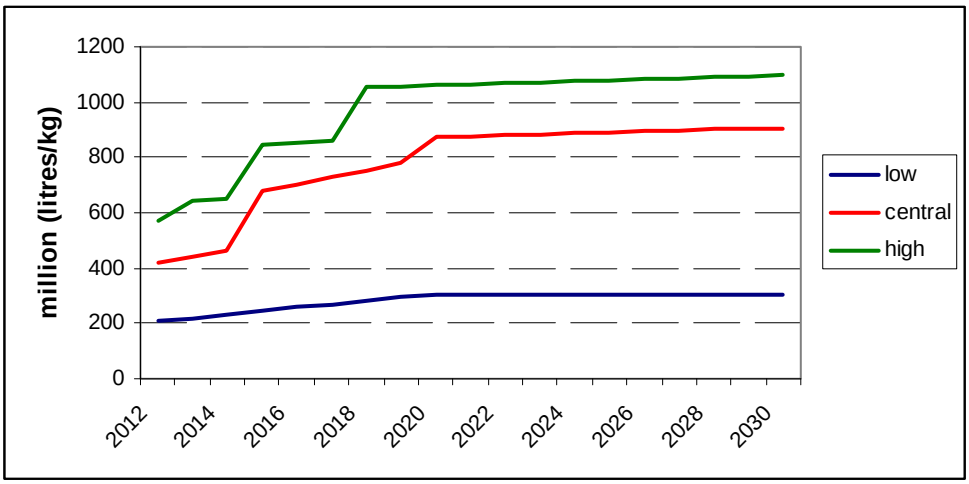
36. The high scenario reflects the fact that there is the potential for a large surge in the supply of waste-derived biofuel (as was witnessed when the UCO-derived biodiesel supply jumped by 1000% following the introduction of the 20ppl duty differential in obligation year 10/11). Several consultation respondents requested that we take into account recently published RTFO supply data relating to this period. In the high scenario, the entire biodiesel supply is assumed to be met through fuels which are double certified (UCO, tallow, biomethane, 2G biodiesel). No specific assumptions have been made about the feedstock mix. The supply of bioethanol from advanced processes is projected to increase from zero to 189 million litres in 2015 and to 378 million litres from 2018 onwards (NNFCC advanced biofuels scenario 2). In the high scenario, the crop-derived biodiesel supply disappears in 2012. Crop-derived ethanol falls off markedly in 2015 and 2018 as 2G bioethanol capacity comes online.

Figure 5: Projected RTFO fuel mix under the high scenario (million litres/kg)

	1G crop biodiesel	1G crop ethanol	2G ethanol	rest
2012	0	1004		571
2013	0	1092		641
2014	0	1071		652
2015	0	666	189	658
2016	0	643	189	664
2017	0	623	189	670
2018	0	228	378	675
2019	0	213	378	679
2020	0	201	378	684
2021	0	190	378	688
2022	0	181	378	692
2023	0	174	378	695
2024	0	168	378	699
2025	0	164	378	703
2026	0	157	378	706

2027	0	150	378	709
2028	0	143	378	712
2029	0	136	378	715
2030	0	129	378	718

Figure 6: aggregated supply scenarios



Costs

RTFO compliance cost

37. For a given obligation level (i.e. volume of biofuel to be supplied), the cost of supplying biofuel required to meet the obligation (which is borne by obligated suppliers and assumed to be passed through to consumers of road transport fuel) is dependent on the market prices for various biofuel options and is not expected to increase as suppliers will still have the option of supplying only crop-derived biofuel if that is the cost effective option. However, costs may fall if suppliers are able to source waste derived biofuel for less than twice the additional cost (per litre) of supplying crop-derived biofuel and therefore choose to supply this instead.

38. As it is expected that the market price of waste-derived biofuel will increase as demand increases, it is not possible to estimate what potential cost saving could be made through the increased supply of waste-derived biofuel. Instead, the analysis makes the conservative assumption that the price of waste-derived biofuel rises such that it would cost the supplier the same whether they provide 2 litres of crop-derived biofuel or one litre of waste-derived biofuel (and therefore no supply constraints on the latter are assumed). Therefore, this estimate should be thought of as an upper bound on potential costs. It is possible that the overall cost of delivering the RTFO could fall as a result of double certification.

39. Additional non-monetised costs (i.e. impacts on other industries which use waste feedstocks, impacts on crop-derived biofuel producers) have been captured in the ‘wider impacts’ section on p.17.

Benefits

40. The primary benefit created from biofuel deployment is GHG savings. Double certification will impact GHG savings delivered by the RTFO which act in two different ways:

    A. Additional GHG savings from increased supply of high GHG saving waste-derived biofuel.
    B. Fewer GHG savings due to crop-derived biofuel being displaced at the rate of 2 litres for every litre of biofuel of waste derived biofuel supplied.

41. The net GHG impact of double certification can be estimated using the deployment trajectories outlined in figure 3 and assumptions around GHG savings for each type of biofuel (figure 4 - below). GHG savings for crop-derived bioethanol and biodiesel and 1st generation waste-derived feedstocks are based upon actual reported (average) figures taken from RTFO data (all data up to January 2011). Figures for bioethanol and biodiesel from advanced processes have are based upon 'typical values' taken from Annex V of the Renewable Energy Directive. GHG savings are shown both as 'volume equivalent' (i.e. the proportional carbon saving associated with displacing one litre of fossil fuel with one litre of biofuel) and 'energy equivalent' (i.e. the proportional carbon saving associated with displacing one unit energy of fossil fuel with one unit energy of biofuel). The relevant measurement for RTFO analysis is 'volume equivalent' as the RTFO is a volume-based target. However, GHG savings are typically presented on an 'energy equivalent' basis, therefore these values have also been included for information.

Figure 4: GHG saving assumptions

Biofuel Type	**Energy Equivalent**	**Volume Equivalent**
1G crop biodiesel	36%	33%
1G crop bioethanol	62%	40%
1G waste biodiesel	83%	76%
2G bioethanol	87%	56%
2G biodiesel	93%	93%

42. The average GHG savings values can then be used to calculate net changes in overall RTFO GHG savings which are presented in figure 5.

Figure 5: estimated GHG impacts due to double certification (MT CO2e)

	low	central	High
2012	0.06	0.12	0.16
2013	0.06	0.12	0.18
2014	0.07	0.13	0.18
2015	0.07	-0.01	0.04
2016	0.07	0.00	0.04
2017	0.08	0.01	0.04
2018	0.08	0.01	-0.10
2019	0.08	0.02	-0.10
2020	0.09	0.08	-0.10
2021	0.09	0.09	-0.09
2022	0.09	0.09	-0.09
2023	0.09	0.09	-0.09
2024	0.09	0.10	-0.09
2025	0.09	0.10	-0.09
2026	0.09	0.10	-0.09

2027	0.09	0.10	-0.09
2028	0.09	0.11	-0.09
2029	0.09	0.11	-0.09
2030	0.09	0.11	-0.09
total	**1.51**	**1.50**	**-0.55**

43. The net change in GHG emissions is determined by the 'volume equivalent' GHG savings of the biofuel being supplied/displaced as a result of double certification. In general, crop-derived biodiesel (which is assumed to deliver a relatively low GHG saving) being displaced a double certified alternative biodiesel (e.g. UCO, tallow, 2G biodiesel) will produce a net GHG saving relative to the baseline. On the other hand, crop-derived bioethanol (which is assumed to deliver a relatively high GHG saving) being displaced by 2G bioethanol delivers a net decrease in GHG savings relative to the baseline.

44. Therefore, the low and central scenarios which involve a greater proportion of biodiesel displacement deliver positive net GHG savings. The high scenario which has a relatively high proportion of 2G bioethanol delivers negative net GHG savings.

45. It is important to note that the GHG emissions/savings covered by this analysis are direct emissions/savings only. GHG emissions attributable to indirect land use change (ILUC) have not been captured and could potentially lead to higher than stated benefits. Other non-monetised sustainability benefits (i.e. food market impacts) have been captured qualitatively in the 'wider impacts' section on p.17 of this impact assessment.

46. GHG savings have been monetised using DECC carbon values. Estimated monetised GHG benefits are presented in figure 6.

Figure 6: monetised GHG savings (£m, 2010 prices, discounted to 2011)

	low	**central**	**high**
2012	2.8	5.6	7.6
2013	2.9	5.8	8.4
2014	3.0	6.0	8.4
2015	3.1	-0.3	1.8
2016	3.2	0.0	1.9
2017	3.3	0.3	1.9
2018	3.4	0.6	-4.2
2019	3.4	0.9	-4.0
2020	3.5	3.5	-3.9
2021	3.5	3.6	-3.9
2022	3.5	3.7	-3.8
2023	3.4	3.8	-3.7
2024	3.4	3.9	-3.7
2025	3.4	3.9	-3.6
2026	3.4	4.0	-3.5
2027	3.3	4.1	-3.5
2028	3.3	4.1	-3.4
2029	3.3	4.2	-3.3
2030	3.2	4.2	-3.2
total	**62.2**	**61.7**	**-17.7**

47. The estimated GHG savings for the levels of supply shown by the three scenarios are shown below.

- The “low” scenario is estimated to create additional GHG savings of 1.5 megatonnes of CO_2e[4] over the period to 2030, with a net present monetised value of £62m.

- The “central” scenario is estimated to create additional GHG savings of 1.5 megatonnes of CO_2e over the period to 2030, with a net present monetised value of £62m.

- The “high” scenario is estimated to create an additional -0.6 megatonnes of CO_2e emissions over the period to 2030, with a net present monetised value of -£18m.

Figure 7: Summary table of carbon savings delivering under low, central and high scenarios (2012 – 2030)

Scenario	Carbon Savings (MTCO2e)	Monetised Carbon Benefit (NPV - £m)
Low	1.5	62
Central	1.5	62
High	-0.6	-18

Interaction with GHG savings from sustainability criteria

48. Implementation of double certification reduces the potential for additional GHG savings to result from implementation of the minimum sustainability criteria (which introduces a minimum GHG saving requirement – see impact assessment #1 in this series). This is because double certification: (1) leads to a reduction in overall volume of biofuel supplied under the RTFO; and (2) increases average GHG savings of biofuel supplied under the RTFO. The combined impact of double certification and the sustainability criteria on GHG savings has been captured in the combined impact assessment has been published alongside this impact assessment.

Risks

49. Double certification may create an incentive for fraud as suppliers would be able to receive additional value by passing off virgin oils as wastes. Suppliers are required to have biofuel independently verified under the RTFO which should mitigate the potential for fraud to some extent. The DfT has responsibility for monitoring potential fraud in the RTFO.

Assumptions

50. The eligible (for double certification) fuels considered in this analysis are tallow-derived biodiesel, UCO-derived biodiesel, municipal waste-derived biomethane and 2G bioethanol and biodiesel. It is possible that additional fuels/feedstocks may become eligible and some of the fuels included in the analysis may not be eligible.

51. It is assumed that obligated suppliers will meet their obligation by blending biodiesel/diesel and bioethanol/petrol in line with the RTFO target (i.e. the petrol/ethanol blend and the diesel/biodiesel blend are 5% biofuel from 2014 onwards). Obligated suppliers are assumed to continue to meet their obligation through ethanol and biodiesel in these

[4] The CO_2e metric stands for CO_2 equivalent and captures other GHG in relative terms to CO_2.

proportions following implementation of double counting. In reality, blending ratios may turn out to be different.

52. 14% of net GHG savings attributable to policy are assumed to take place in the 'traded sector' (e.g. within refineries captured by the EU Emissions Trading Scheme) and are priced using the traded price of carbon values. The remaining 86% of net GHG savings are assumed to take place within the 'non-traded sector' (e.g. agricultural emissions) and are valued using non-traded sector carbon values. This assumption is based upon internal analysis.

Administrative burden and policy savings calculations

53. There is no expected increase in administrative burden other than potentially the need for increased anti-fraud measures. This has not been quantified.

Wider Impacts

Feedstock markets

54. Double certification will increase obligated suppliers' demand for biofuel derived from eligible feedstocks. Which feedstocks are 'wastes and residues' and thus eligible for double counting are likely to include fuels derived from feedstocks such as used cooking oil, some forms of tallow, waste wood, wood chips etc. Increased demand for these biofuels is expected, in some cases, to lead to higher feedstock prices which may have knock-on impacts in other sectors which currently use these feedstocks.

55. In the case of tallow-derived biodiesel, double certification could potentially increase obligated suppliers' willingness to pay for tallow by around £220/tonne[5] which could potentially drive a price increase of between 30% and 40% for 'category 3' tallow (higher grade typically used by the oleochemicals industry and for animal feed) and between 44% and 55% for 'category 1' tallow (lower grade typically used for energy production through combustion) relative to current market prices.

Figure 8: Current tallow prices

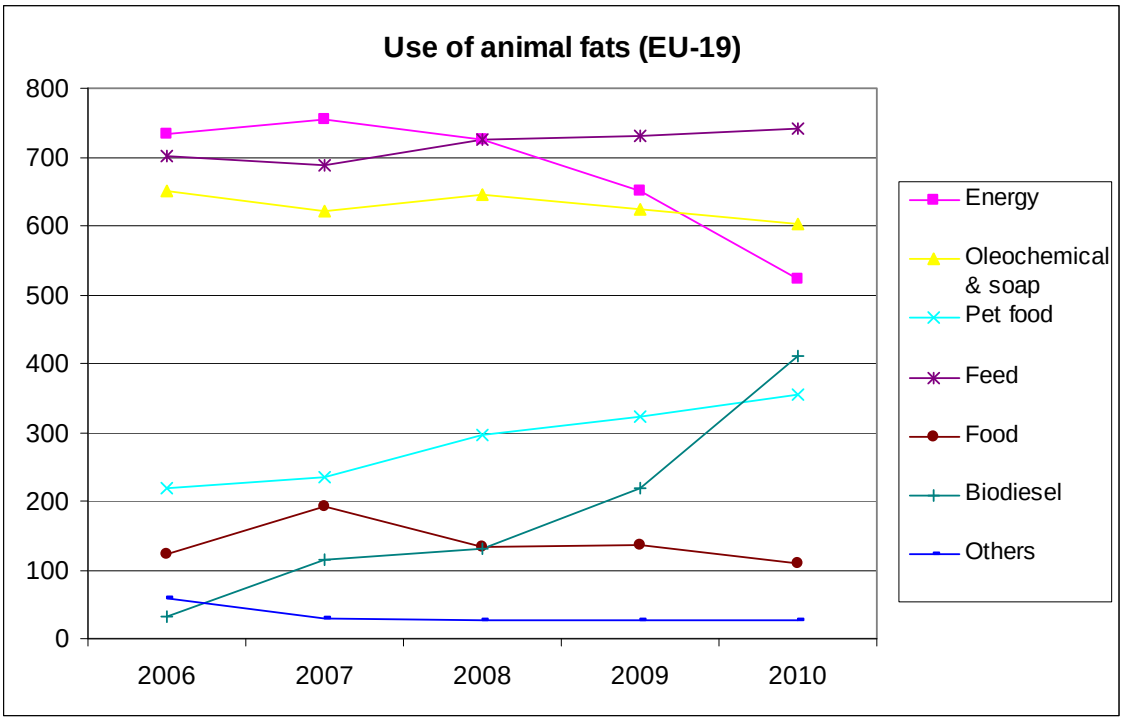
tallow grade	current price (£/tonne)
'category 1 & 2' tallow	400 - 500
'category 3' tallow	550 - 750

Source: Ecofys analysis for DfT

56. In the case of the oleochemical industry, a significant increase in the price of category 3 tallow would be expected to have a negative impact on profitability and could potentially lead to the use of more expensive substitutes (i.e. virgin vegetable oil in place of tallow). If feedstock price increases were sufficiently large they could threaten the economic viability of the industry which has an estimated turnover of around £400m per annum and is thought to account for 1350 -1450 UK jobs.

[5] assuming a 20p Renewable Transport Fuel Certificate Price

Figure 9 - Use of animal fats ('000 tonnes) in EU 19 2006-2010



Source: European Fat Processors and Renderers Association (EFPRA). Numbers are derived from EFPRA members, so not an EU total, but the leading producers are included.

57. Figure 9 shows the final use of tallow across the EU-19 from 2006 to 2010. Although it is not possible to say precisely which categories of tallow were used for each end use, for regulatory reasons it is assumed that only ‘category 3’ tallow was used in ‘oleochemical & soap’, ‘feed’ and ‘food’ end uses.

58. If tallow were to be made eligible for double certification, it is expected that biodiesel producers would first use lower-priced ‘category 1’ and potentially ‘category 2’ tallow before moving up the cost curve to ‘category 3’ tallow. This view is supported by historical EU consumption data which appears to show a trend whereby tallow which has been previously used for energy production has been diverted into biodiesel production (figure 9). As tallow (and tallow-derived biodiesel) is a globally traded commodity, the extent to which more expensive grades of tallow would be used for biodiesel production will not only depend upon double certification classification within the UK but also the classifications applied in other EU Member States (i.e. if more Member States double count all grades of tallow, it is more likely that ‘category 3’ tallow will be diverted into biodiesel production).

59. If double certification were limited to lower grades of tallow, there is a risk that category 1 and 2 could become more valuable than category 3 due to the additional incentives and categories 3 materials could ‘disappear’ as renderers choose not to produce the higher grade materials (if the value of category 1 tallow was to rise sufficiently there would be an financial incentive for this to happen). The category of tallow is defined by the inputs, and the production of category 1 and 2 tallow required less pre-processing and is thus a simpler process than production of category 3).

60. At present only a minority of Member States have announced how they intend to classify fuels for double certification. Of those which have publicly committed to a classification,

Germany has opted to exclude tallow entirely from their biofuel mandate from 2012 onwards and France has opted to double count tallow but has imposed a cap on how much can be used in any given year.

Indirect land use change

61. Increased use of waste-derived biofuel (at the expense of crop-derived biofuel – particularly biodiesel) may lead to lower GHG emissions from Indirect Land Use Change (ILUC). It has not been possible to quantify this potential impact due to a lack of robust evidence. In general, indirect GHG emissions from waste-derived biofuel are thought to be lower than for crop-derived biofuel. However, this may not be the case for all wastes. For example, palm oil (which is typically associated with high GHG emissions from land use change) is thought to be a direct substitute for some grades of tallow in the oleochemical industry. If this is the case, increased supply of tallow-derived biofuel may not lead to overall lower emissions owing to ILUC. As noted in paragraph 49, a further classification and consultation process will be undertaken before the list of fuels eligible for double counting will be finalised.

Food prices

62. Increasing the share of waste-derived biofuels in the UK biofuel mix decreases the risk of biofuels contributing to increases in food prices. However, there is as yet no clear consensus on how to quantify and value any potential links between biofuel demand and food prices. Therefore any such possible impacts have been excluded from the analysis.

Crop-derived biofuel producers

63. A decrease in demand for crop-derived biofuels due to double certification of waste-derived biofuel will reduce RTFO-driven demand for crop-derived biofuel which may have a negative impact on the profitability of crop-derived biofuel producers.

Fuel Quality Directive

64. Double certification may impact upon the UK's ability to meet Fuel Quality Directive (FQD) transport sector GHG saving targets (6% reduction in lifecycle GHGs by 2020) if it leads to a change in GHG savings. The changes in GHG savings modelled in this impact assessment are relatively small (both positive and negative), therefore it is expected that any impact on meeting the GHG target will also be small.

Summary and preferred option

65. The preferred option is to introduce double certification of wastes, as this will demonstrate compliance with the RED and is expected to increase the supply of highly sustainable biofuels, mitigating concerns over adverse impacts on food markets and GHG emissions from ILUC.

Annexes

Annex 1 should be used to set out the Post Implementation Review Plan as detailed below. Further annexes may be added where the Specific Impact Tests yield information 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. If the policy is subject to a sunset clause, the review should be carried out sufficiently early that any renewal or amendment to legislation can be enacted before the expiry date. 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 basis of the review could be statutory (forming part of the legislation), i.e. a sunset clause or a duty to review , or there could be a political commitment to review (PIR)]; A review of all the RTFO amendments proposed in this consultation exercise will be conducted in advance of April 2014.
Review objective: [Is it intended as a proportionate check that regulation is operating as expected to tackle the problem of concern?; or as a wider exploration of the policy approach taken?; or as a link from policy objective to outcome?] The objective of the review will be to ensure that the RTFO amendments are performing as intended.
Review approach and rationale: [e.g. describe here the review approach (in-depth evaluation, scope review of monitoring data, scan of stakeholder views, etc.) and the rationale that made choosing such an approach] The review will consist of an analysis of the impact of the RTFO amendments and will draw upon collected market data and stakeholder views.
Baseline: [The current (baseline) position against which the change introduced by the legislation can be measured] Detailed data on the RTFO which is currently gathered by the RTFO administrator will be used to form the baseline.
Success criteria: [Criteria showing achievement of the policy objectives as set out in the final impact assessment; criteria for modifying or replacing the policy if it does not achieve its objectives] Success will be determined by an increase in the supply of highly sustainable biofuel.
Monitoring information arrangements: [Provide further details of the planned/existing arrangements in place that will allow a systematic collection systematic collection of monitoring information for future policy review] The RTFO administrator collects detailed data on RTFO performance.
Reasons for not planning a review: [If there is no plan to do a PIR please provide reasons here]

Annex 2 - Competition Assessment

66. Waste may be supplied by small firms, as well as processed into biofuel by small firms. Double-certification of waste-derived biofuel may increase the opportunities for greater competition in the biofuels market, as smaller suppliers of waste-derived biofuels would have a greater opportunity to capture market share of overall biofuels demand. Double certification for waste-derived biofuels gives an advantage to suppliers of waste-derived biofuels over suppliers of crop-based biofuels.

Annex 3 - Small Firms Assessment

67. The Renewable Transport Fuel Obligations Order exempts small transport fuel suppliers (supplying less than 450,000 litres/year). From having to supply biofuel under the RTFO.

68. Waste may be supplied by small firms as well as processed into biofuel by small firms. Double-certification of waste-derived biofuels would improve these firms' cashflow through increasing the revenues they can earn from waste-derived biofuel. This would lead to better conditions for the expansion of such firms, as their revenues and cashflow, as well as their ability to leverage investment, would be improved. However, small firms could also be suppliers of non-waste-derived biofuels which are partly displaced.

Annex 4 - Rural Proofing Assessment

69. Several suppliers of waste-derived biofuels, and their input waste feedstocks, are likely to be based in rural locations. Double certification of waste-derived biofuels would increase the demand for such biofuels. Such an increase in demand may result in expansion of such firms (and possibly their supply chains), potentially leading to an increase in rural employment and productivity. However, many suppliers of crop-based biofuels (which would be partly displaced) are also in rural areas. It is not possible to assess the magnitude of these potential effects due to a lack of available evidence.

Annex 5 - Sustainable Development

70. Any increase in GHG savings delivered through an increase in waste-derived biofuels will help ensure that the growth in biofuels in transport delivers substantial carbon reductions and helps tackle dangerous climate change. Waste-derived biofuels are thought to be among the most sustainable forms of biofuel, and they reduce risks of indirect land use change and increasing food prices through reducing demand for agricultural land (which would be required for crop-based biofuels).

Annex 6 - Resource Potential Estimates

71. AEA technology and E4tech (research consultancies) have produced estimates of UK-sourced used cooking oil and tallow available to the transport sector. These resource potentials are captured in the following tables.

Figure 10: UCO and tallow resource potential scenarios

Low scenario

	2010	2015	2020	2025	2030
UCO biodiesel - PJ	3.5	4.0	4.6	5.0	5.5
UCO biodiesel - litres	105.6	122.3	138.9	152.8	166.7
Tallow biodiesel - PJ	1.5	2.8	4.2	4.8	5.4
Tallow biodiesel - litres	44.9	86.8	128.8	146.7	164.7

Central scenario

	2010	2015	2020	2025	2030

UCO biodiesel - PJ	4.4	4.8	5.3	6.2	7.1
UCO biodiesel - litres	133.4	147.3	161.2	188.9	216.7
Tallow biodiesel - PJ	8.8	8.8	8.8	8.8	8.8
Tallow biodiesel - litres	269.5	269.5	269.5	269.5	269.5

High scenario

	2010	2015	2020	2025	2030
UCO biodiesel - PJ	5.5	5.9	6.4	6.8	7.3
UCO biodiesel - litres	166.7	180.6	194.5	208.4	222.3
Tallow biodiesel - PJ	9.8	9.8	9.8	9.8	9.8
Tallow biodiesel - litres	299.5	299.5	299.5	299.5	299.5

Annex 7 - NNFCC Advanced Biofuels Scenarios

72. Assumptions around the future deployment of biofuel from advanced processes were based upon NNFCC research, the results of which are summarised in Figure 9.

Figure 11: NNFCC advanced biofuel scenarios (million litres)

	scenario 1 (central)		**scenario 2 (high)**	
	2G bioethanol	2G biodiesel	2G bioethanol	2G biodiesel
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0
2015	189	0	0	0
2016	189	0	189	0
2017	189	0	189	0
2018	189	0	189	0
2019	189	0	378	239
2020	189	0	378	239
2021	189	239	378	478
2022	189	239	378	478
2023	189	239	378	478
2024	189	239	378	478
2025	189	239	378	478
2026	189	239	378	478
2027	189	239	378	478
2028	189	239	378	478
2029	189	239	378	478
2030	189	239	378	478

Annex 8 One In One Out

This measure is out of scope as it is from a European origin and we do not propose to go beyond the minimum European requirements.