EXPLANATORY MEMORANDUM TO

THE RENEWABLE TRANSPORT FUEL OBLIGATIONS (AMENDMENT) ORDER 2009

2009 No. 843

1. This explanatory memorandum has been prepared by the Department for Transport and is laid before Parliament by Command of Her Majesty.

2. Purpose of the instrument

The Order amends the Renewable Transport Fuel Obligations Order 2007 (S.I. 2007/3072) ("the RTFO Order"). The RTFO Order imposes an obligation on suppliers of fossil fuel for road transport to produce renewable transport fuel certificates ("RTF certificates") showing that in each obligation year a specified proportion of fuel supplied is renewable fuel. This Order ("the Amending Order"):

- reduces the increases in the amount of renewable fuel required to be supplied under the obligation in the obligation years between April 2009 and April 2013;
- makes two new types of renewable fuel (biobutanol and renewable diesel) eligible for RTF certificates and deletes a description of renewable fuel as a consequence of changes to the Hydrocarbon Oil Duties Act 1979 (section 20AAA); and
- extends the scope of the definition of "relevant hydrocarbon oil" which is the fossil fuel taken into account in determining whether a supplier is obligated and, if so, in calculating the number of certificates which the supplier must produce.

3. Matters of special interest to the Joint Committee on Statutory Instruments

There are no matters of special interest to the Joint Committee on Statutory Instruments.

4. Legislative Context

4.1 The Amending Order is made under the Energy Act 2004. The RTFO Order was also amended by section 13 of the Finance Act 2008. The changes to section 20AAA of the Hydrocarbon Oil Duties Act 1979 which require consequential changes to be made by the Amending Order to the RTFO Order are contained in section 14 of and Schedule 5 to the Finance Act 2008.

4.2 Ruth Kelly, the then Secretary of State for Transport, outlined to Parliament on 7th July 2008[1] the steps that the UK Government would take to respond to concerns about the sustainability and food supply impacts of indirect land use change that might be caused by biofuels. These steps included consulting upon proposals to

[1] Hansard 7th July 2008 : Column 1169

reduce the annual rate of increase in the RTFO obligation level. Lord Adonis, the Minister of State for Transport, announced the launch of the relevant consultation in a statement to Parliament on 15th October 2008[2].

4.3 The proposal to change the definition of relevant hydrocarbon oil was brought to Parliament's attention in a statement from Lord Adonis, the Minister of State for Transport, on 13th November 2008.[3]

5. Territorial Extent and Application

This instrument applies to all of the United Kingdom.

6. European Convention on Human Rights

The Minister of State for Transport, Lord Adonis has made the following statement regarding Human Rights:

> *In my view the provisions of the Renewable Transport Fuel Obligations (Amendment) Order are compatible with the Convention rights.*

7. Policy background

7.1 The RTFO Order obliges suppliers in the UK of fossil fuel for road transport to produce evidence showing that a specified proportion of fuel supplied is renewable fuel. The evidence is in the form of RTF certificates issued for each litre of renewable fuel supplied. The amount of renewable fuel for which RTF certificates must be produced by a supplier in an obligation year is a proportion of the fossil fuel (or "relevant hydrocarbon oil") supplied by the supplier. This proportion is known as the obligation level and it increases every year under the RTFO Order until in 2010/11 it reaches 5.2632% of the relevant hydrocarbon oil, which corresponds to 5% of the total fossil and renewable fuel supplied.

The lowering of future obligation levels

7.2 The RTFO Order sets the obligation level at 2.5% of total fuel supplied (2.5641% of relevant hydrocarbon oil supplied) for the obligation year commencing on 15th April 2008, 3.75% of total fuel supplied (3.8961% of relevant hydrocarbon oil) for the obligation year 2009/10 and 5% (5.2632%) for subsequent years. The Amending Order slows down the rate at which the obligation level increases, so that for the obligation year commencing 15th April 2009 the obligation level will be 3.25% of total fuel supplied (3.3592% of relevant hydrocarbon oil), for the obligation year 2010/11 it will be 3.5% of total fuel supplied (3.6269% of relevant hydrocarbon oil), for 2011/12 4% (4.1667%), for 2012/13 4.5% (4.7120%), and for 2013/14 and subsequent years 5% (5.2632%).

[2] Hansard 15th Oct 2008 : Column 45WS
[3] Hansard 13th Nov 2008 : Column WS58

7.3 This change to the obligation levels is being made in response to concerns about the sustainability and food supply impacts of indirect land use change. The Government early last year commissioned a review to consider these concerns. The review (*The Gallagher Review on the indirect effects of biofuel production*) was published in July 2008 and concluded that there is a future for a sustainable biofuels industry, but that the Government should proceed with caution until the wider environmental and social impacts of biofuel production are better understood.

Amending the definition of "relevant hydrocarbon oil"

7.4 It was realised part-way through the current obligation year (2008/09) that the definition of "relevant hydrocarbon oil" in the RTFO Order does not cover all fossil fuels which the Government intended to cover and which the term had been interpreted as covering. The effect of this shortcoming in the definition is that the fossil fuel components of bioblends and bioethanol blends are not taken into account in determining whether a transport fuel supplier is subject to the obligation, and, if so, in calculating how many RTF certificates the supplier must produce.

7.5 It is common practice in refineries to blend and mix at least the diesel streams (bioblends) before they are supplied for the purpose of the RTFO Order and accordingly a substantial amount of fossil fuel falls outside the current definition of relevant hydrocarbon oil.

7.6 The Amending Order will amend the definition so as to include the fossil fuel components of bioblends and bioethanol blends. The amendment will take effect for the obligation year commencing 15th April 2009 and subsequent obligation years. Although the Government would have liked to make the change effective for the current obligation year commencing 15th April 2008, the Amending Order does not purport to do this in order to avoid problems with retrospective effect. The powers in the Energy Act 2004 do not allow the Order to have such effect.

The introduction of two new types of eligible renewable transport fuels

7.7 The Amending Order adds two new renewable transport fuels to the list of renewable fuels eligible for RTF certificates under the RTFO Order, biobutanol and renewable diesel. Renewable diesel is different from biodiesel; it uses oil refinery techniques to transform vegetable oils into a fuel that is chemically very similar to conventional diesel, in contrast to biodiesel, which is pure FAME (fatty acid methyl ester). It is understood that some fuel suppliers will start introducing either biobutanol or renewable diesel to the UK market soon. These fuels offer superior compatibility with existing fuels and engines and should be encouraged by being counted as renewable transport fuels within the RTFO. Renewable diesel is designated as a renewable transport fuel because, if made from waste cooking oil, it is not certain that it would be a biofuel as defined in section 132 of the Energy Act 2004. It is not necessary to designate biobutanol in the same way; it is defined as produced wholly from biomass, and it therefore already falls within the definition of a renewable transport fuel.

7.8 The Amending Order also removes from the RTFO Order one of the descriptions of eligible renewable fuel (mixtures of rebated heavy oil and biodiesel), because it has been rendered obsolete by a change to the duty charging provisions in the Hydrocarbon Oil Duties Act 1979.

- Consolidation

7.9 It is not intended to consolidate the RTFO Order at this time.

8. Consultation outcome

8.1 A formal public consultation took place between 15th October and 17th December 2008. The consultation period was foreshortened to nine weeks so that the Amending Order could be made and brought into effect by the start of the next obligation year on 15th April 2009. An addendum to the consultation was issued on 13th November 2008 to address the problem which had been discovered with the definition of relevant hydrocarbon oil and the consequence of the change to the Hydrocarbon Oil Duties Act 1979, with the same closing date of 17th December.

8.2 This compressed timetable was necessary in order to enable the Parliamentary procedure for amending the RTFO Order to be completed in time for 15th April 2009. The RTFO Order establishes obligations that run from 15th April one year to 14th April the next, and any changes that affect legal rights and duties during the obligation year, such as a change to the definition of relevant hydrocarbon oil, need to be in place by the beginning of the obligation year so as to avoid the risk that they have retrospective effect. Also suppliers wish to know before the start of an obligation year what the obligation level will be that year so that they can plan their business operations accordingly. All stakeholders were made aware of the Government's proposal to lower future obligation levels and include new eligible fuels well before the consultation started. Stakeholders understood the importance of achieving the changes by 15th April 2009 and accepted the shortened consultation period.

8.3 Stakeholders from the oil industry, the renewable fuels industry, UK agriculture and environmental groups were consulted. The Government received 89 responses to the consultation. Of these, 22 were from members of the public.

8.4 A detailed analysis of the responses is in the Government's response to the consultation, published on 28 January 2009 and available in the Houses' Libraries and at http://www.dft.gov.uk/pgr/roads/environment/rtfo/rtforesponses

8.4 Consultees were split on the two substantive issues addressed. On slowing down the rate of increase in the obligation level, environmental groups were generally in favour of the lowest levels possible, whilst those in the biofuels industry wanted them as high as possible. On amending the definition of relevant hydrocarbon oil, the majority of the biofuels industry would have liked a retrospective amendment that applied from 15th April 2008. If that were not possible, then a compensating increase in the 2009/10 obligation level should be considered.

8.5 In response the Government concluded that it would be appropriate to increase the obligation level, for 2009/10 only, to a level above that proposed as the Government's favoured option in the consultation (the favoured proposed level was 3.0928% of fossil fuel supplied which would correspond to 3.00% of total renewable and fossil fuel supplied). The Amending Order instead sets the obligation level for 2009/10 at 3.3592% of fossil fuel supplied (corresponding to 3.25% of total renewable and fossil fuel supplied). This is within the 2.5 to 3.75% range that stakeholders were consulted upon for that year.

9. Guidance

The Renewable Fuels Agency will amend its guidance on the RTFO Order as a result of the changes made by the Amending Order.

10. Impact

10.1 The impact on business, charities or voluntary bodies is set out in the attached Impact Assessment.

10.2 There is no specific impact on the public sector.

10.3 An Impact Assessment is attached to this memorandum.

11. Regulating small business

11.1 The legislation applies to small business.

11.2 To minimise the impact of the requirements on firms employing up to 20 people, the RTFO Order exempts from the obligation fossil fuel suppliers who supply less than 450,000 litres of relevant hydrocarbon oil in an obligation year.

12. Monitoring & review

The RTFO Order contains a duty for the Renewable Fuels Agency to report annually to Parliament on the operation of the obligation.

13. Contact

Sam Waugh at the Department for Transport Tel: 020 7944 5283 or email: sam.waugh@dft.gsi.gov.uk can answer any queries regarding the instrument.

Summary: Intervention & Options

Department /Agency:	**Title:**	
Department for Transport	**Impact Assessment of proposals for amending the Renewable Transport Fuels Obligation Order**	
Stage: Final Proposal	**Version:** 1	**Date:** January 2009
Related Publications:		

Available to view or download at:

Contact for enquiries: Sam Waugh **Telephone:** 02079445283

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

Since the Renewable Transport Fuel Obligation (RTFO) came into effect on 15 April 2008 concerns have been expressed about the wider environmental and social impacts of biofuels. The "Gallagher review" investigated the indirect effects of biofuel production and recommended that until further evidence is collected, the rate of increase in the obligation level should be slowed to 0.5% per annum so that it reaches 5% in 2013/14 rather than in 2010/11 as provided in the Renewable Transport Fuel Obligations Order 2007. Secondly, it was recently realised that the definition of 'relevant hydrocarbon oil' in the RTFO Order does not cover all fossil fuels which the Government intended to cover and which the term had been interpreted as covering. Without amending the order the RTFO will not have the intended impact in encouraging biofuel consumption.

What are the policy objectives and the intended effects?

The RTFO was introduced as a way of delivering significant greenhouse gas savings from the transport sector by obliging road transport fuel suppliers to ensure that an increasing percentage of the fuel supplied in the UK comes from renewable sources. The deceleration of the obligation level increase as recommended by Professor Gallagher's review is based on the need to proceed cautiously until the evidence is clearer about the wider environmental and social effects of biofuels.
Also, amending the definition of 'relevant hydrocarbon oil' to guarantee that fossil fuel components of bioblends and bioethanol blends are taken into account will ensure that the order has the intended coverage and will incentivise the use of biofuel.

What policy options have been considered? Please justify any preferred option.

1. Amend the 'relevant hydrocarbon' definition but do not amend the increase in the RTFO level to 3.75% of total fuel supplied in 2009-10 and 5% in 2010-11 as set out in the RTFO Order.
2. Amend the 'relevant hydrocarbon oil' definition and freeze the level of the RTFO at 2.5%.
3. Amend the 'relevant hydrocarbon oil' definition and slowdown the planned increase in the RTFO level to 0.5% a year from 2009-10 so that the 5% level is reached in 2013-14.
4. Amend the 'relevant hydrocarbon oil' definition and slowdown the planned increase in the RTFO to 3.25% in 2009-10, 3.5% in 2010-11, 4.0% in 2011-12, 4.5% in 2012-13 and 5% in 2013-14.

Preferred option - Option 4

When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects? The impacts of the RTFO will continue to be reviewed with quarterly interim reports and detailed annual reports. The programme will be reviewed after three years of operation.

Ministerial Sign-off For Final proposal/implementation stage Assessments:

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

Signed by the responsible Minister: Andrew Adonis

....Date: 5 February 2009

Summary: Analysis & Evidence

Policy Option: Option 4	**Description: Amend the definition of 'relevant hydrocarbon oil' to include biofuel blends and reduce the RTFO level to 3.25% in 2009-10, 3.5% in 2010-11, 4.0% in 2011-12, 4.5% in 2012-13 and 5% in 2013-14**

COSTS

ANNUAL COSTS		Description and scale of **key monetised costs** by 'main affected groups'
One-off (Transition)	**Yrs**	Additional fuel resource costs = **£6,254m to £280m**
£0m		Welfare loss due to reduced driving = **£20m to £0m**
Average Annual Cost (excluding one-off)		
£570m to £25m		**Total Cost** (PV) **£6,274m to £280m**

Other **key non-monetised costs** by 'main affected groups' Possible indirect impacts on biodiversity, food prices and release of GHG if growing biofuels requires land use change.

BENEFITS

ANNUAL BENEFITS		Description and scale of **key monetised benefits** by 'main affected groups'
One-off	**Yrs**	GHG emissions saved = **£477m to £810m**
£ 0		
Average Annual Benefit (excluding one-off)		
£43m to £74m		**Total Benefit** (PV) **£477m to £810m**

Other **key non-monetised benefits** by 'main affected groups' Ancillary impacts arising from a decrease in air pollution are estimated to be between £3m-£39m. There may be other benefits with biofuels including: increased market/employment opportunities in agriculture and biofuel production; diversity and security of supply of energy; possible positive impact on innovation; likely positive impact on congestion.

Key Assumptions/Sensitivities/Risks Results are presented as a range based on different oil and biofuel price scenarios. The Oil price scenarios range from $45 to $150 per barrel, biofuel prices range from 30ppl-50ppl (pence per litre) for bioethanol and 40ppl-60ppl for biodiesel, and GHG savings from 20% to 50%. The estimates of green house gas emission savings from biofuels have not taken indirect factors into account due to limited knowledge on the full impact that these factors may have, therefore there is uncertainty about the GHG savings these biofuels provide.

Price Base Year 2008	Time Period Years 11	**Net Benefit Range** (NPV) **-£5,797m to £533m**	**NET BENEFIT** (NPV Best estimate) **-£5,797m to £533m**

What is the geographic coverage of the policy/option?			UK	
On what date will the policy be implemented?			April 2009	
Which organisation(s) will enforce the policy?			RFA	
What is the total annual cost of enforcement for these organisations?			n/a	
Does enforcement comply with Hampton principles?			Yes	
Will implementation go beyond minimum EU requirements?			No	
What is the value of the proposed offsetting measure per year?			n/a	
What is the value of changes in greenhouse gas emissions?			£477m to £810m	
Will the proposal have a significant impact on competition?			No	
	Micro	Small	Medium	Large
Are any of these organisations exempt?	Yes	No	No	No

Impact on Admin Burdens Baseline (2005 Prices) (Increase - Decrease)

Increase of	£ n/a	Decrease of	£ n/a	**Net Impact**	£ n/a

Key: Annual costs and benefits: Constant Prices | (Net) Present Value

Guide to interpretation of "Summary: Analysis and Evidence" pages

The previous "Summary: Analysis and Evidence" page presents the costs and benefits information for the option analysed. More detailed information on the option including the methodology used to estimate the costs and benefits is provided under the relevant section in the Evidence Base.

A "Summary: Analysis and Evidence" page has been completed for the option under consideration. There are a number of costs and benefits identified for the option. The **first order (or direct) costs** relate to the higher fuel resource cost from biofuel use and the welfare cost to drivers from increased costs of driving. The **first order benefits** come from net well-to-wheel CO2 saved from biofuels.

The option could also lead to **second order (or ancillary) costs/benefits**. These come from what we call the 'rebound effect'. This is where increased fuel resource costs will increase driving costs and will encourage less driving. If people drive less then this is likely to lead to improved air quality. These second order effects are included in the key non-monetised costs/benefits boxes of the "Summary: Analysis and Evidence" page.

As explained in the evidence base, there is considerable uncertainty around the expected costs and benefits of this policy measure. In recognition of this, we have also carried out sensitivity analysis around a range of assumptions (e.g. oil price forecasts, biofuel price assumptions, GHG savings from biofuels) to explore how changing some of these assumptions affect the results.

When summarising the costs and benefits in the preceding summary sheet, we have picked out the highest and lowest Net Present Value (NPV) [4] for the option considered. The range of costs and benefits presented are those associated with these highest and lowest NPV's. The lowest NPV does not include the ancillary impacts, whereas the highest NPV does. This is to present the widest range of the analysis.

For example, the figures in the 'Net Benefit (NPV best estimate)' box in the first summary sheet (see page 2 of the Impact Assessment) range from a Net Present Value (NPV) of -£5,797m to £533m. This is the biggest range possible for the NPV. The -£5,797m figure (our 'worst' case) is based on a scenario where the extra resource costs are high (due to a low oil price and high biofuel price) and CO2 emission savings from biofuels are at their lowest, 20%. The £533m figure assumes low additional fuel resource costs (due to a high-high oil price and energy equivalent biofuel price), CO2 emission savings from biofuels are 50% and includes the ancillary impacts. The ranges in all the costs and benefits boxes in the top half of the page are all based on these same assumptions used in the 'Net Benefit (NPV best estimate)' box.

[4] The balance of the future costs and benefits converted into equivalent values today.

Description of the option summarised on this page.

There are not expected to be any one-off costs or benefits. On-going costs and benefits are presented as the average cost per year in 2007 prices in the yellow boxes.

Description of some of the key assumptions underpinning the cost and benefit calculations

The year from which the prices used in the analysis are expressed; the time period used for the analysis.

The net benefit range shows the present valu of benefits minus the present value of costs. The range reflects the very worst scenario up to the very best scenario. These are in 2008prices.

Summary: Analysis & Evidence

Policy Option: 4	**Description:** Amend the definition of 'relevant hydrocarbon oil' to include biofuel blends and reduce the RTFO level to 3.25% in 2009-10, 3.5% in 2010-11, 4.0% in 2011-12, 4.5% in 2012-13 and 5% in 2013-14

COSTS

ANNUAL COSTS		Description and scale of key monetised costs by 'main affected groups'
One-off (Transition)	**Yrs**	Additional fuel resource costs = **£6,254m to £280m**
£ 0m		Welfare loss due to reduced driving = **£20m to £0m**
Average Annual Cost (excluding one-off)		
£570m to £25m		Total Cost (PV) **£6,274m to £280m**

Other key non-monetised costs by 'main affected groups'
Possible indirect impacts on biodiversity, food prices and release of GHG if growing biofuels requires land use change.

BENEFITS

ANNUAL BENEFITS		Description and scale of key monetised costs by 'main affected groups'
One-off (Transition)	**Yrs**	GHG emissions saved = **£477m to £810m**
£ 0m		
Average Annual Benefit (excluding one-off)		
£43m to £74m		**Total Benefit (PV)** **£477m to £810m**

Other key non-monetised benefits by 'main affected groups'
Ancillary impacts arising from a decrease in air pollution are estimated to be between £3m-£39m. There may be other benefits with biofuels including: increased market/employment opportunities in agriculture and biofuel production; diversity and security of supply of energy; possible positive impact on innovation; likely positive impact on congestion.

Key assumptions/Sensitivities/Risks Results are presented as a range based on different oil and biofuel price scenarios. The Oil price scenarios range from $45 to $150, biofuel prices range from 30ppl-50ppl for bioethanol and 40ppl-60ppl for biodiesel, and GHG savings from 20% to 50%. The estimates of green house gas emission savings from biofuels have not taken indirect factors into account due to limited knowledge on the full impact that these factors may have, therefore there is uncertainty about the GHG savings these biofuels provide.

Price Base Year 2008	**Time Period Years 11**	Net Benefit Range **(NPV)** **-£5797m to £533m**	NET BENEFIT **(NPV Best estimate)** **-£5,797m to £533m**

What is the geographic coverage of the policy/option?	**UK**
On what date will the policy be implemented?	**2009**
Which organisation(s) will enforce the policy?	**RFA**
What is the total annual cost of enforcement for these organisations?	**'a**
Does enforcement comply with Hampton principles?	**Yes**
Will implementation go beyond minimum EU requirements?	**No**
What is the value of the proposed offsetting measure per year?	**'a**
What is the value of changes in greenhouse gas emissions?	**477m to 810m**
Will the proposal have a significant impact on competition?	**No**

Annual cost (£-£) per organisation (excluding one-off)	Micro	Sma	Med	Large
Are any of these organisations exempt?	Yes	No	No	**No**

Impact on Admin Burdens Baseline **(2005 Prices)** **(Increase - Decrease)**

Increase of £ **n/a** **Decrease £n/a** Net Impact £ **n/a**

Description of the first-round effects of the policy, valued in monetary terms. Where a range is presented, this reflects the costs /benefits associated with the NPV range. These costs and benefits are calculated over the life of the measure and are expressed in present value (2008 prices).

Description of non-monetised costs and benefits and 'second-order' (or 'ancillary') effects of the policy, valued in monetary terms where possible.

The NPV best estimate shows the 'central case' excluding ancillary impacts.

Estimate the average annual greenhouse gas saving, valued according to the Defra guidance on the shadow price of carbon.

Evidence Base (for summary sheets)

Overview

The case for government intervention

A market failure occurs when the free market acts in a way which does not maximise society's welfare. One example of this is climate change resulting from greenhouse gas emissions, which is formally known as a negative externality. Where there is no incentive for the free market to rectify this it may be appropriate for public policy to do so through government intervention in the market. Further action is needed in order for the UK to meet its 2020 and 2050 climate change goals and move towards becoming a low carbon economy in the absence of incentives for the free market to do so.

The Stern Review on the Economics of Climate Change identified possible solutions to avoid the "irreversible impacts from climate change". The Review stressed the importance of taking action on three fronts: (i) creating a common carbon price to reflect the marginal damage of greenhouse gas emissions; (ii) promoting a shift towards low carbon technologies; and (iii) removing barriers to behaviour change. The Renewable Transport Fuels Obligation is focused on the second of these strands - incentivising innovation and the development of lower cost, low carbon technology.

It is common for new technologies to take considerable time to develop in terms of their functionality, efficiency and affordability as well as their public acceptability. An inability of some new technologies to overcome barriers to market entry in the short or medium term can result in the persistence of imperfect competition. One reason for the delay in such technologies entering the market can be unease over the level of risk in investment decisions with uncertain outcomes and payback periods. If the government can intervene in the market to reduce these uncertainties, possibly through regulations which create a minimum level of demand, then it would be reasonable to expect investment to increase.

The market for transport fuels in the UK is very price competitive. The additional costs of renewable energy including biofuels over fossil fuels effectively restrict the impact that renewables can have on the marketplace without Government intervention.

Introduction to Biofuels

Biodiesel, bioethanol and biogas (referred to in the 2007 Order as "natural road fuel gas…,produced wholly from biomass") are the most common biofuels available to the UK road transport fuel market. However, the amendment to the RTFO Order will add biobutanol and renewable diesel to this list. It is not expected that the inclusion of biobutanol or renewable diesel will have any significant impact and thus they do not appear in the rest of this assessment.

Biodiesel can be made from any vegetable oil, with rape seed, palm and used cooking oil being the most common. Although chemically different, it has similar properties to mineral diesel when burnt in a compression diesel engine. However, at high blend levels certain types may harm parts of an engine and consequently engine manufacturers currently only warrant their vehicles for use with 5% blends in line with the CEN standards.

Bioethanol can be made from wheat, corn or sugar cane / beet. As with potable alcohol, it can be made from virtually any organic substance (grass, wood, green bits of municipal solid waste), but the technologies for doing so are not proven at a commercial scale. In Europe it is used in a

5% blend in petrol (E5), allowing its use without any engine modification. At low blending levels of 5% or less, it is not anticipated that mechanical considerations are a significant obstacle to ethanol up-take. There are significant distribution issues for bioethanol which mean that it is usually blended with petrol at the time of loading into road tankers for distribution to forecourts.

Biogas is just like compressed natural gas (CNG), except that it is generally produced by collecting the methane which is naturally emitted from landfill sites or other forms of rotting vegetation. It is only suitable for use in CNG-powered vehicles (of which there are only 800 or so in the UK).

Biofuels can offer emission savings, because the CO2 that is emitted into the atmosphere when they are burned is offset by the CO2 that the crop has absorbed as it grows. In this sense they are different from fossil fuels, which emit into the atmosphere CO2 which has been safely locked away under the earth's surface for millions of years. The CO2 savings from biofuels are, however, offset by the energy that is needed for cultivation, harvesting, processing and transportation. The best biofuels are those which are produced using the least energy (eg low inputs of fertiliser, processed in an energy-efficient way and transported short distances) and minimise land use change. The worst biofuels can theoretically result in greater lifecycle CO2 emissions than fossil fuels (ie more energy is needed to produce them than is saved by using them).

Background – the existing RTFO Order, definition discrepancy and the Gallagher Review

In April 2008, the Government introduced a Renewable Transport Fuel Obligation (RTFO), requiring transport fuel suppliers to ensure that 5% of total road fuel sales by volume (equivalent to about 4% by energy) are from renewable sources by 2010-11, with targets of 2.5% and 3.75% for 2008-09 and 2009-10 respectively. The Renewable Fuels Agency (RFA) was created to administer the RTFO.

The Gallagher Review

Recent concerns that the production of biofuels could lead to increases in emissions rather than reducing them led the Government to commission a major review of the indirect effects of biofuel production in February 2008. The review was led by Professor Gallagher, Chair of the Renewable Fuels Agency.

The "Gallagher Review" was published on 7 July 2008 and is available at http://www.dft.gov.uk/rfa/_db/_documents/Report_of_the_Gallagher_review.pdf. The main conclusions of the review included:

- biofuels can contribute greenhouse gas savings from transport, but only where significant emissions from land-use change are avoided and appropriate production technologies are employed;

- there is a risk that current biofuel policies will lead to a net increase in GHG emissions and impact upon biodiversity as a result of the displacement of existing agricultural production;

- the introduction of biofuels in both the UK and EU should be slowed until adequate controls to address displacement effects are implemented and demonstrated to be effective; and

- in the UK, the rate of increase in the UK's RTFO should be slowed to 0.5% per annum so that the RTFO reaches 5% in 2013/14 rather than 2010/11 as currently planned.

In response to the Gallagher review, the Government accepted that there was a case for a degree of caution support for biofuels until the evidence is clearer about the wider environmental and social effects of biofuels. Also, the Government would consult on slowing down the rate of increase in the RTFO in line with Professor Gallagher's recommendations.

Discrepancy in the definition of "relevant hydrocarbon oil"

Part-way through the current obligation year (2008/09) it was realised that the definition of "relevant hydrocarbon oil" in the RTFO Order did not cover all fossil fuels which the Government intended to cover. The effect of this shortcoming in the definition is that the fossil fuel components of bioblends and bioethanol blends are not taken into account in calculating how many RTF certificates the supplier must produce. It is common practice in refineries to blend and mix at least the diesel streams (bioblends) before they are supplied for the purpose of the RTFO Order and accordingly a substantial amount of fossil fuel fell outside the current definition of relevant hydrocarbon oil.

The Amending Order will amend the definition so as to include the fossil fuel components of bioblends and bioethanol blends. The amendment will take effect for the obligation year commencing 15th April 2009 and subsequent obligation years.

EU Directives and future biofuel targets

The Renewable Energy Directive (RED) includes a mandatory 10% (by energy content) target by 2020 for renewable fuels in transport. The target may be met by increased consumption of biofuels and other renewables such as renewable electricity in electric cars and trains. In addition, the Fuel Quality Directive (FQD) contains a 6% reduction in the lifecycle greenhouse gas emissions of road transport fuels between 2010 and 2020.

<u>For the purposes of this impact assessment though the baseline counterfactual is the 5% volume biofuels obligation to 2020 which is contained in the RTFO order 2007. The expected 2020 targets described above have not been included in this analysis as they are not yet formally adopted and the details of how they will be implemented in the UK is to be decided. Also, the impact of the slowdown of the rate of increase of the obligation level is limited from 2009-10 to 2013-14 and the slowdown is not expected to significantly impact on the UK's strategy to meet the 2020 targets.</u>

This impact assessment accompanies the explanatory memorandum and estimates the potential costs and benefits from:

Option 4: Amend the definition of 'relevant hydrocarbon oil' to include biofuel blends and slow down the planned increase in the RTFO level to 3.25% of total fuel supplied in 2009-10, 3.5% in 2010-11, 4.0% in 2011-12, 4.5% in 2012-13 and 5% in 2013-14

How would this work?

Without redefining 'relevant hydrocarbon oil' to include bioblends and bioethanol blends, the expected market supply of biofuels would be limited in 2009-10 and is assumed to be near zero for the years after as fuel suppliers adjust their blending processes to minimise their obligation. The expected supply of biofuel is illustrated in table one, more detail on this scenario can be found in the 'Assumptions and Impacts' section below.

This option amends the definition of 'relevant hydrocarbon oil' to include fossil fuel from bioblends and bioethanol blends, and slows down the increase in the obligation level. Instead of increasing to 3.75% of total fuel supplied in 2009-10 and 5% in 2010-11, the RTFO would increase to 3.25% in 2009-10, 3.5% in 2010-11, 4.0% in 2011-12, 4.5% in 2012-13 and 5.0% in 2013-14 and thereafter. However, due to the use of certificate carry over from one obligation year to another the actual biofuel supply will follow a slightly different trend. As illustrated in table 1 and chart 1 below, in 2009-10 biofuel use will be closer to 3.3% and in 2010-11 2.6%. Further explanation of this can be found in the 'Assumptions and Impacts' section from page 13.

The impact of this amendment order is the change in the **actual biofuel supply** from an adjustment in the 'relevant hydrocarbon oil' definition **and** slowing down of the increase in the RTFO. These are illustrated in table 1 and chart 1 (solid lines) below.

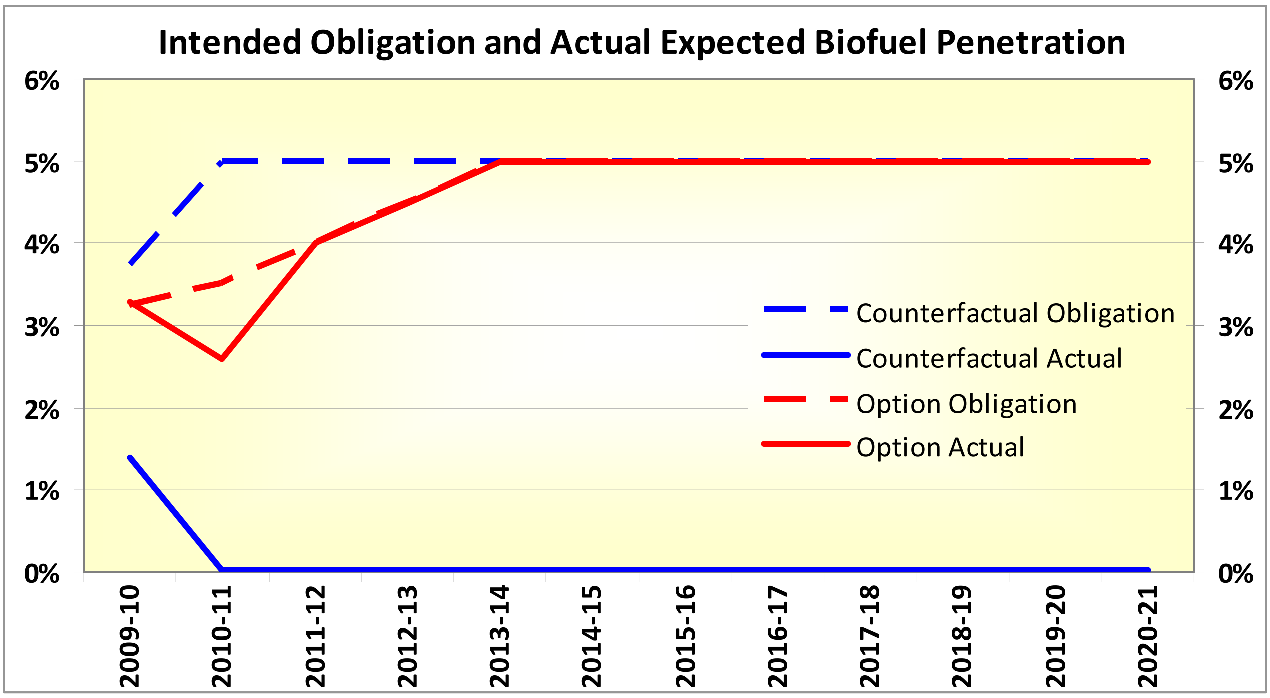
Table 1: Obligation level and actual biofuel market supply

	Counterfactual		**Amend and Slow down increase in RTFO (Option 4)**	
	Obligation Level %	**Actual Biofuel Supply %[1]**	**Obligation Level %**	**Actual Biofuel Supply %[1]**
2009-10	3.75%	1.4%	3.25%	3.3%
2010-11	5.0%	0.0%[2]	3.5%	2.6%
2011-12	5.0%	0.0%	4.0%	4.0%
2012-13	5.0%	0.0%	4.5%	4.5%
2013-14 to 2020-2021	5.0%	0.0%	5.0%	5.0%

[1] These 'Actual Supply' assumptions are explained thoroughly in 'Assumption and Impacts' from page 13. Essentially, 2009-10 actual supply is assumed to be 1.4%, as half the fuel that would have been under the obligation is diesel which with the definition discrepancy would no longer be covered. Thus the supply halves to 1.8%. Also, 25% of the 2009-10 obligation will be met through certificates accumulated in 2008-09, reducing actual supply to 1.4%.

[2] This is not quite zero, but near zero. We have assumed that fuel suppliers adjust their operations to blend a small amount of fuel with fossil fuel so that the fossil fuel no longer falls under the obligation due to the definition discrepancy.

Chart 1: Actual biofuel market supply



Summary of costs and benefits

Tables 2.1 to 2.4 below summarise the estimated costs and benefits of amending the definition of 'relevant hydrocarbon oil' to include biofuel blends **and** slow down the planned increase in the RTFO to 3.25% in 2009-10, 3.5% in 2010-11, 4.0% in 2011-12, 4.5% in 2012-13 and 5% in 2013-14. This is analysed under four oil prices, three biofuel price and two biofuel GHG emission scenarios. Explanations and discussion of the assumptions used in the analysis can be found in the 'Assumption and Impacts' section from page 13.

Low Oil Price ($45bbl)

Table 2.1a: Impact to 2020-21 of adjusting the RTFO Order to rectify the discrepancy and slowdown the increase in obligation levels – with a Low oil price ($45bbl)

	Low Biofuel price scenario	Central Biofuel price scenario	High Biofuel price scenario
Biofuel with 50% GHG saving			
Present value costs	-£4,581m	-£5,428m	-£6,274m
- Of which fuel costs	-£4,570m	-£5,413m	-£6,254m
- Of which welfare loss	-£11m	-£15m	-£20m
Present value benefits (CO2 saved)	£912m	£931m	£950m
- CO2 saved ($MtCO_{2e}$) in 2020	3.5$MtCO_{2e}$	3.6$MtCO_{2e}$	3.8$MtCO_{2e}$
- CO2 saved ($MtCO_2$) in 2009-2020	38$MtCO_{2e}$	39$MtCO_{2e}$	39$MtCO_{2e}$
Ancillary Benefits	£29m	£34m	£39m
Net Present Value[1]	-£3,669m	-£4,497m	-£5,324m
Net Present Value (with ancillary)	-£3,640m	-£4,463m	-£5,286m
Biofuel with 20% GHG saving			
Present value costs	-£4,581m	-£5,428m	-£6,274m
- Of which fuel costs	-£4,570m	-£5,413m	-£6,254m
- Of which welfare loss	-£11m	-£15m	-£20m
Present value benefits	£439m	£458m	£477m
- CO2 saved ($MtCO_{2e}$) in 2020	1.6$MtCO_{2e}$	1.8$MtCO_{2e}$	1.9$MtCO_{2e}$
- CO2 saved ($MtCO_2$) in 2009-2020	18$MtCO_{2e}$	19$MtCO_{2e}$	20$MtCO_{2e}$
Ancillary Benefits	£29m	£34m	£39m
Net Present Value[1]	-£4,142m	-£4,970m	-£5,797m
Net Present Value (with ancillary)	-£4,113m	-£4,936m	-£5,758m
Non-monetised Impacts	Positive impacts on innovation, security of supply and congestion. Possible negative impacts on biodiversity and release of GHG if there is land use change.		

[1] Reflects total benefits minus total costs discounted over the lifetime of the measure. These costs and benefits exclude 'ancillary impacts'' e.g. air quality.

Table 2.1b: NPV impact to 2020-21 on Government, Firms and Consumers of adjusting the RTFO Order - with a Low oil price ($45bbl)

	Low Biofuel price scenario	Central Biofuel price scenario	High Biofuel price scenario
NPV impact on Government	+£961m	+£973m	+£985m
NPV impact on Firms	-£3,444m	-£4,015m	-£4,585m
NPV impact on Consumers (50%)	-£1,215m	-£1,489m	-£1,764m
NPV impact on Consumers (20%)	-£1,688m	-£1,962m	-£2,236m

Positive numbers signify benefits, negative numbers signify costs. Figures include ancillary impacts.

Table 2.1c: Energy and pump price impact in 2020-21 of adjusting the RTFO Order to rectify the discrepancy and slowdown the increase in obligation levels – with a Low oil price ($45bbl)

	Low Biofuel price scenario	Central Biofuel price scenario	High Biofuel price scenario
Increase in renewable energy (TJ)	+71,468	+72,563	+72,482
Reduction in fossil fuels (m litres)	-2,083m	-2,188m	-2,236m
Impact on Road Petrol price (ppl)	+0.3ppl (+0.3%)	+0.7ppl (+0.7%)	+1.1ppl (+1.2%)
Impact on Road Diesel price (ppl)	+1.0ppl (+1.1%)	+1.7ppl (+1.8%)	+2.3ppl (+2.5%)

Central Oil Price ($70bbl)

Table 2.2a: Impact to 2020-21 of adjusting the RTFO Order to rectify the discrepancy and slowdown the increase in obligation levels – with a Central oil price ($70bbl)

	Low Biofuel price scenario	Central Biofuel price scenario	High Biofuel price scenario
Biofuel with 50% GHG saving			
Present value costs	-£3,233m	-£4,070m	-£4,906m
- Of which fuel costs	-£3,227m	-£4,061m	-£4,894m
- Of which welfare loss	-£6m	-£9m	-£12m
Present value benefits (CO2 saved)	£875m	£892m	£909m
- CO2 saved ($MtCO_{2e}$) in 2020	3.3$MtCO_{2e}$	3.5$MtCO_{2e}$	3.6$MtCO_{2e}$
- CO2 saved ($MtCO_2$) in 2009-2020	36$MtCO_{2e}$	37$MtCO_{2e}$	38$MtCO_{2e}$
Ancillary Benefits	£19m	£24m	£28m
Net Present Value[1]	-£2,358m	-£3,178m	-£3,997m
Net Present Value (with ancillary)	-£2,339m	-£3,154m	-£3,969m
Biofuel with 20% GHG saving			
Present value costs	-£3,233m	-£4,070m	-£4,906m
- Of which fuel costs	-£3,227m	-£4,061m	-£4,894m
- Of which welfare loss	-£6m	-£9m	-£12m
Present value benefits	£401m	£418m	£436m
- CO2 saved ($MtCO_{2e}$) in 2020	1.5$MtCO_{2e}$	1.6$MtCO_{2e}$	1.7$MtCO_{2e}$
- CO2 saved ($MtCO_2$) in 2009-2020	17$MtCO_{2e}$	17$MtCO_{2e}$	18$MtCO_{2e}$
Ancillary Benefits	£19m	£24m	£28m
Net Present Value[1]	-£2,832m	-£3,651m	-£4,470m
Net Present Value (with ancillary)	-£2,812m	-£3,627m	-£4,442m
Non-monetised Impacts	Positive impacts on innovation, security of supply and congestion. Possible negative impacts on biodiversity and release of GHG if there is land use change.		

[1] Reflects total benefits minus total costs discounted over the lifetime of the measure. These costs and benefits exclude 'ancillary impacts'' e.g. air quality.

Table 2.2b: NPV impact to 2020-21 on Government, Firms and Consumers of adjusting the RTFO Order - with a Central oil price ($70bbl)

	Low Biofuel price scenario	Central Biofuel price scenario	High Biofuel price scenario
NPV impact on Government	+£1,000m	+£1,024m	+£1,048m
NPV impact on Firms	-£2,518m	-£3,089m	-£3,660m
NPV impact on Consumers (50%)	-£860m	-£1,136m	-£1,412m
NPV impact on Consumers (20%)	-£1,334m	-£1,610m	-£1,886m

Positive numbers signify benefits, negative numbers signify costs. Figures include ancillary impacts.

Table 2.2c: Energy and pump price impact in 2020-21 of adjusting the RTFO Order to rectify the discrepancy and slowdown the increase in obligation levels – with a Central oil price ($70bbl)

	Low Biofuel price scenario	Central Biofuel price scenario	High Biofuel price scenario
Increase in renewable energy (TJ)	+72,724	+72,651	+72,578
Reduction in fossil fuels (m litres)	-2,096m	-2,138m	-2,181m
Impact on Road Petrol price (ppl)	-0.1ppl (-0.1%)	+0.3ppl (+0.3%)	+0.7ppl (+0.7%)
Impact on Road Diesel price (ppl)	+0.4ppl (+0.4%)	+1.0ppl (+1.0%)	+1.7ppl (+1.6%)

High Oil Price ($95bbl)

Table 2.3a: Impact to 2020-21 of adjusting the RTFO Order to rectify the discrepancy and slowdown the increase in obligation levels – with a High oil price ($95bbl)

	Low Biofuel price scenario	Central Biofuel price scenario	High Biofuel price scenario
Biofuel with 50% GHG saving			
Present value costs	-£1,914m	-£2,742m	-£3,569m
- Of which fuel costs	-£1,911m	-£2,737m	-£3,563m
- Of which welfare loss	-£3m	-£5m	-£6m
Present value benefits (CO2 saved)	£844m	£859m	£875m
- CO2 saved ($MtCO_{2e}$) in 2020	3.2$MtCO_{2e}$	3.3$MtCO_{2e}$	3.5$MtCO_{2e}$
- CO2 saved ($MtCO_2$) in 2009-2020	35$MtCO_{2e}$	36$MtCO_{2e}$	36$MtCO_{2e}$
Ancillary Benefits	£11m	£19m	£19m
Net Present Value[1]	-£1,070m	-£1,882m	-£2,695m
Net Present Value (with ancillary)	-£1,059m	-£1,867m	-£2,676m
Biofuel with 20% GHG saving			
Present value costs	-£1,914m	-£2,742m	-£3,569m
- Of which fuel costs	-£1,911m	-£2,737m	-£3,563m
- Of which welfare loss	-£3m	-£5m	-£6m
Present value benefits	£370m	£385m	£401m
- CO2 saved ($MtCO_{2e}$) in 2020	1.4$MtCO_{2e}$	1.5$MtCO_{2e}$	1.6$MtCO_{2e}$
- CO2 saved ($MtCO_2$) in 2009-2020	15$MtCO_{2e}$	16$MtCO_{2e}$	17$MtCO_{2e}$
Ancillary Benefits	£11m	£19m	£19m
Net Present Value[1]	-£1,544m	-£2,356m	-£3,168m
Net Present Value (with ancillary)	-£1,533m	-£2,341m	-£3,149m
Non-monetised Impacts	Positive impacts on innovation, security of supply and congestion. Possible negative impacts on biodiversity and release of GHG if there is land use change.		

[1] Reflects total benefits minus total costs discounted over the lifetime of the measure. These costs and benefits exclude 'ancillary impacts'' e.g. air quality.

Table 2.3b: NPV impact to 2020-21 on Government, Firms and Consumers of adjusting the RTFO Order - with a High oil price ($95bbl)

	Low Biofuel price scenario	Central Biofuel price scenario	High Biofuel price scenario
NPV impact on Government	+£999m	+£1,032m	+£1,065m
NPV impact on Firms	-£1,583m	-£2,155m	-£2,727m
NPV impact on Consumers (50%)	-£498m	-£775m	-£1,052m
NPV impact on Consumers (20%)	-£972m	-£1,249m	-£1,526m

Positive numbers signify benefits, negative numbers signify costs. Figures include ancillary impacts.

Table 2.3c: Energy and pump price impact in 2020 of adjusting the RTFO Order to rectify the discrepancy and slowdown the increase in obligation levels – with a High oil price ($95bbl)

	Low Biofuel price scenario	Central Biofuel price scenario	High Biofuel price scenario
Increase in renewable energy (TJ)	+72,788	+72,722	+72,656
Reduction in fossil fuels (m litres)	-2,059m	-2,098m	-2,136m
Impact on Road Petrol price (ppl)	-0.4 ppl (-0.4%)	+0ppl (+0%)	+0.4ppl (+0.4%)
Impact on Road Diesel price (ppl)	-0.2ppl (-0.2%)	+0.4ppl (+0.4%)	+1.1ppl (+0.9%)

High-High Oil Price ($150bbl)

Table 2.4a: Impact to 2020-21 of adjusting the RTFO Order to rectify the discrepancy and slowdown the obligation – with a High-High oil price ($150bbl)

		Central Biofuel price scenario	High Biofuel price scenario
Biofuel with 50% GHG saving			
Present value costs		-£280m	-£789m
- Of which fuel costs		-£280m	-£788m
- Of which welfare loss		-£0m	-£1m
Present value benefits (CO2 saved)		£810m	£818m
- CO2 saved ($MtCO_{2e}$) in 2020		3.2$MtCO_{2e}$	3.2$MtCO_{2e}$
- CO2 saved ($MtCO_2$) in 2009-2020		34$MtCO_{2e}$	34$MtCO_{2e}$
Ancillary Benefits		£3m	£4m
Net Present Value[1]		£530m	£29m
Net Present Value (with ancillary)		£533m	£33m
Biofuel with 20% GHG saving			
Present value costs		-£280m	-£789m
- Of which fuel costs		-£280m	-£788m
- Of which welfare loss		-£0m	-£1m
Present value benefits		£336m	£334m
- CO2 saved ($MtCO_{2e}$) in 2020		1.3$MtCO_{2e}$	1.4$MtCO_{2e}$
- CO2 saved ($MtCO_2$) in 2009-2020		14$MtCO_{2e}$	14$MtCO_{2e}$
Ancillary Benefits		£3m	£4m
Net Present Value[1]		£58m	-£446m
Net Present Value (with ancillary)		-£105m	-£441m
Non-monetised Impacts	Positive impacts on innovation, security of supply and congestion. Possible negative impacts on biodiversity and release of GHG if there is land use change.		

[1] Reflects total benefits minus total costs discounted over the lifetime of the measure. These costs and benefits exclude 'ancillary impacts'' e.g. air quality.

Table 2.4b: NPV impact to 2020-21 on Government, Firms and Consumers of adjusting the RTFO Order - with a High-High oil price ($150bbl)

		Central Biofuel price scenario	High Biofuel price scenario
NPV impact on Government		+£963m	+£991m
NPV impact on Firms		-£451m	-£706m
NPV impact on Consumers (50%)		-£16m	-£261m
NPV impact on Consumers (20%)		-£459m	-£736m

Positive numbers signify benefits, negative numbers signify costs. Figures include ancillary impacts.

Table 2.4c: Energy and pump price impact in 2020-21 of adjusting the RTFO Order to rectify the discrepancy and slowdown the obligation – with a High-High oil price ($150bbl)

		Central Biofuel price scenario	High Biofuel price scenario
Increase in renewable energy (TJ)		+72,815	+72,784
Reduction in fossil fuels (m litres)		-2,041m	-2,036m
Impact on Road Petrol price (ppl)		-0.9ppl (-0.7%)	-0.3ppl (-0.2%)
Impact on Road Diesel price (ppl)		-0.6ppl (-0.4%)	-0.3ppl (-0.2%)

Assumptions and Impacts

Counterfactual and Option Assessed

Counterfactual Biofuel Supply

The impact of the option considered is compared against a counterfactual where the RTFO obligation is not amended and neither is the definition of 'relevant hydrocarbon oil'. It is assumed, as illustrated in table 5 below, that due to the current definition of 'relevant hydrocarbon oil' biofuel market supply may only be 1.4% in 2009-10 and almost zero for the years after.

This has been estimated by taking the current obligation level in 2009-10, 3.75% of total fuel supply, and halving it to 1.875% as the vast majority of diesel supplied will not come under the obligation as it is blended with biodiesel. It is also assumed that the obligated fuel suppliers have accumulated enough certificates in the 2008-09 obligation year to meet 25% of the 2009-10 obligation, this reduces the actual biofuel supply to 1.4%. It has then been assumed that for 2010-11 and the years after, the fuel suppliers will be able to adjust their handling of biofuel so that virtually zero hydrocarbon fuel will fall under the obligation.

Biofuel Supply with 'relevant hydrocarbon oil' definition amendment

If the definition of 'relevant hydrocarbon oil' is amended without any slowdown in the obligation level increase then, as illustrated in table 5 and chart 2 below, it has been assumed that the biofuel supply will be 4.1% in 2009-10, 3.8% in 2010-11 and 5% from 2011-12 and onwards. This scenario has been partially based on scenarios developed by the Renewable Fuels Agency that were set out in their response to the 2008 RTFO Order consultation:

http://www.renewablefuelsagency.org/rfa/news&pressreleases/news.cfm?cit_id=250&FAArea1=customWidgets.content_view_1

This scenario has been estimated by taking the current obligation in 2009-10, 3.75% of total fuel supplied. We have assumed that the obligated fuel suppliers have accumulated enough certificates in the 2008-09 obligation year to meet 25% of the 2009-10 obligation. This reduces the actual biofuel supply to 2.8%. However, we have also assumed that fuel suppliers will increase the amount of biofuels to accumulate enough certificates to meet 25% of the 2010-11 obligation. Fuel suppliers may do this to take advantage of the 20ppl duty differential in 2009-10 that will be reduced to zero in 2010-11. Overall this will increase biofuel supply to 4.1% in 2009-10. As during 2009-10, 25% of 2010-11's obligation is assumed to have been accumulated with the result that biofuel supply in 2010-11 will be 25% less than the obligation, from 5% to 3.75%.

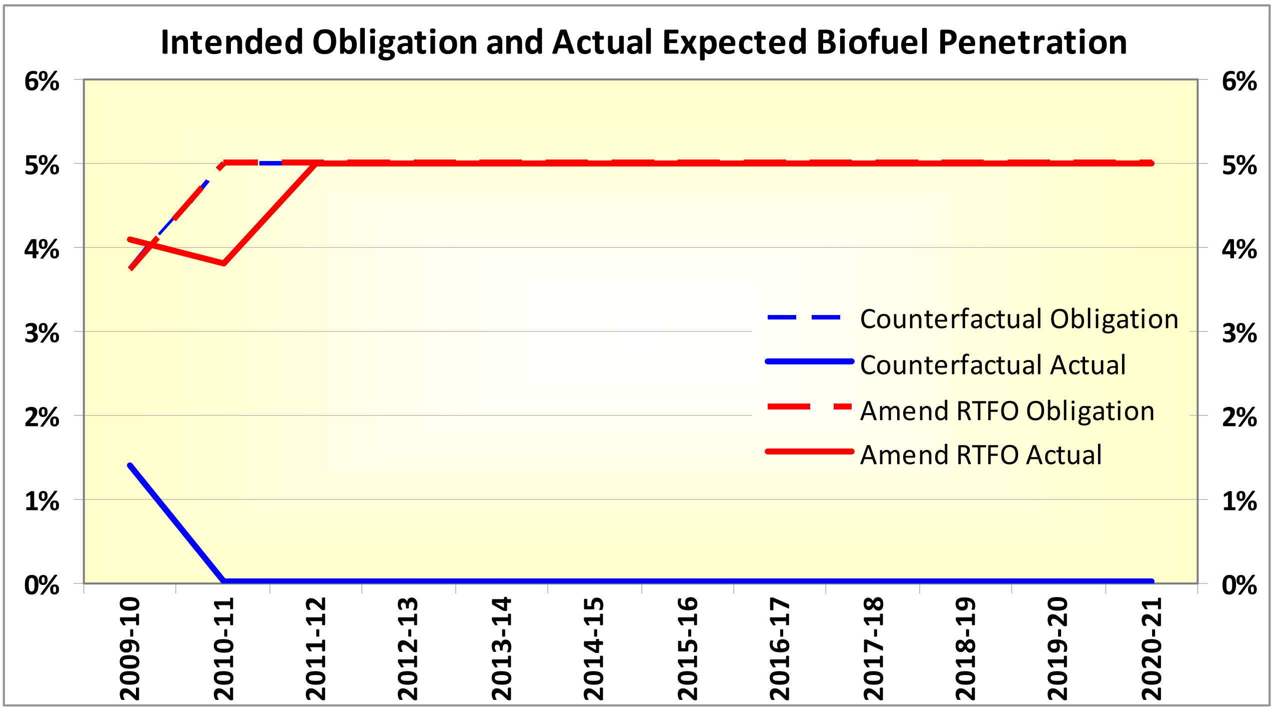
Table 5: Biofuel supply for the Counterfactual and the Definition Amendment

	Counterfactual		Amend RTFO Order	
	Obligation Level %	**Actual Biofuel Supply%**	**Obligation Level %**	**Actual Biofuel Supply %**
2009-10	3.75%	1.4%	3.75%	4.1%
2010-11	5.0%	0.0%[1]	5.0%	3.8%
2011-12	5.0%	0.0%	5.0%	5.0%
2012-13	5.0%	0.0%	5.0%	5.0%
2013-14 to 2020-2021	5.0%	0.0%	5.0%	5.0%

[1] This is not zero, but near zero as some biofuel will have to be used to blend with fossil fuel.

The impact of the amendment to the definition of 'relevant hydrocarbon oil' is the difference between the solid lines in chart 2 below.

Chart 2: Biofuel supply for the Counterfactual and the Definition Amendment



Biofuel Supply with Definition Amendment and Obligation Slowdown

If the rate of increase in the RTFO obligation is slowed down then, it has been assumed that the biofuel supply will be 3.3% in 2009-10, 2.6% in 2010-11, 4.0% in 2011-12, 4.5% in 2012-13 and then 5% from 2013-14 and onwards. This is illustrated in Table 6 and Chart 3 below.

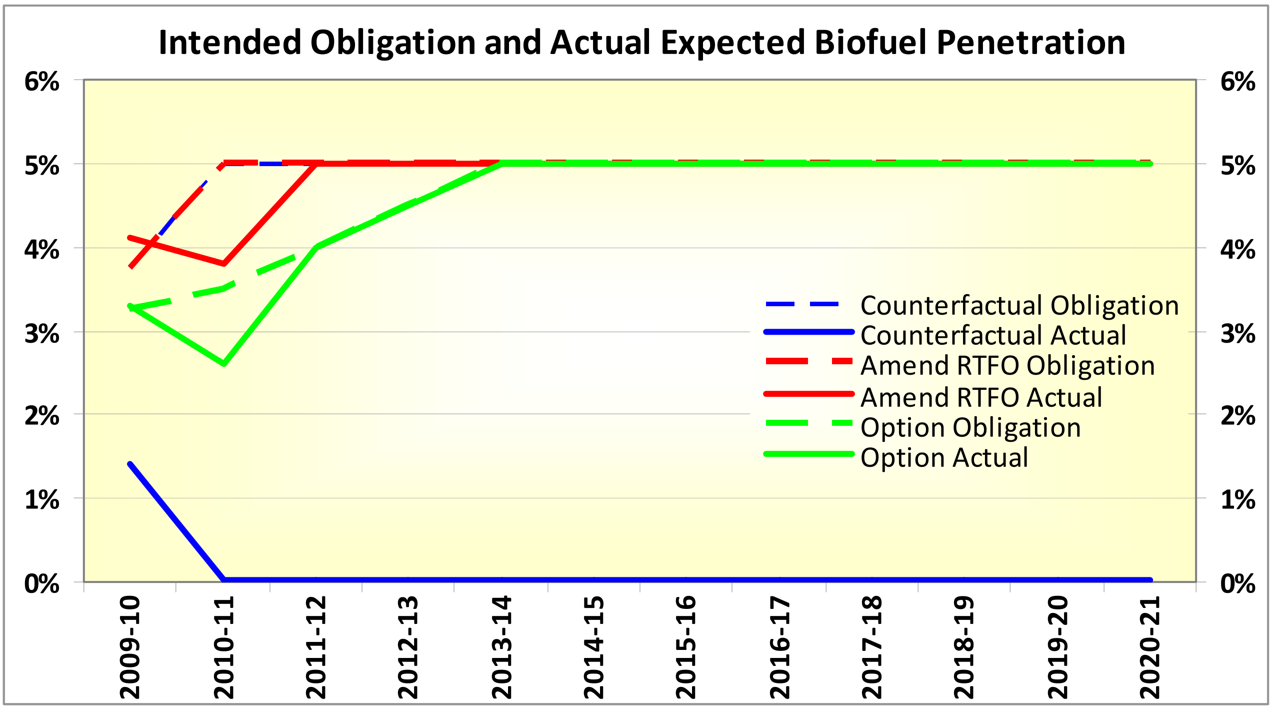
This scenario has been estimated by taking the obligation level specified in the Amendment Order for 2009-10, 3.25%. We have assumed that the obligated fuel suppliers have accumulated enough certificates in the 2008-09 obligation year to meet 25% of the 2009-10 obligation. This reduces the actual biofuel supply to 2.4%. However, we have also assumed that fuel suppliers will increase the amount of biofuels to accumulate enough certificates to meet 25% of the 2010-11 obligation to take advantage of the duty differential. Overall this will increase biofuel supply to 3.3% in 2009-10. Further, 25% of 2010-11's obligation is thus assumed to have been accumulated in 2009-10 with the result that biofuel supply in 2010-11 will be 25% less than the obligation, from 3.5% to 2.6%. Biofuel supply is then expected to be the same as the obligation from 2011-12 onwards.

Table 6: Biofuel supply for Counterfactual, Amendment and Amendment + Slowdown

	Counterfactual		Amend RTFO Order		Amend and Slow down RTFO (Option 4)	
	Obligation %	**Actual Biofuel %**	**Obligation %**	**Actual Biofuel %**	**Obligation %**	**Actual Biofuel %**
2009-10	3.75%	1.4%	3.75%	4.1%	3.25%	3.3%
2010-11	5.0%	0.0%	5.0%	3.8%	3.5%	2.6%
2011-12	5.0%	0.0%	5.0%	5.0%	4.0%	4.0%
2012-13	5.0%	0.0%	5.0%	5.0%	4.5%	4.5%
2013-14 to 2020-2021	5.0%	0.0%	5.0%	5.0%	5.0%	5.0%

The impact of the amendment to the definition of 'relevant hydrocarbon oil' is the difference between the blue and red solid lines in chart 3 below, the additional impact of the slowdown is then the difference between the red and green solid lines. Overall the impact of the amendments to the order is the difference between the blue and green solid lines.

Table 3: Biofuel supply for Counterfactual, Amendment and Amendment + Slowdown



Consumption of biodiesel and bioethanol

So far in the current RTFO obligation year (2008-09) consumption of biodiesel has contributed to meeting 84% of the obligation with bioethanol meeting the other 16%. One of the main reasons for biodiesel meeting the majority of the obligation is that it is cheaper and easier to handle and distribute in a blend with fossil fuel compared with bioethanol. In the future we expect this to continue, even when the obligation reaches 5%, as the new blending limits within the Fuel Quality Directive will allow a 7% biodiesel blend. This will allow the use of biodiesel to continue to be consumed more and this analysis has assumed that biodiesel will contribute towards 80% of the biofuel obligation.

Monetised Costs

Fuel Resource Costs Savings

Analysing the potential increase in fuel resource cost of a policy involves comparing the total fuel cost to consumers and businesses for the policy option and the counterfactual. This involves estimating the cost of fuel and multiplying it by the quantity of fuel consumed, for each scenario. Thus in estimating the increase in fuel resource cost of amending the RTFO order and slowing down the obligation, the following were analysed:

1) The variable resource cost of biofuels compared to fossil fuels – biofuels generally cost more than fossil fuels, so an increase in their use from the amendment to the Order will increase fuel costs,
2) The increased fuel consumed due to the energy penalty of biofuels - biofuels have a lower energy content than fossil fuels, so an increase in their use from the amendment to the Order increases the number of litres of fuel needed to travel a certain distance and thus increases fuel costs;
3) The lower fuel consumed due to reduced km's driven – the higher cost of driving from higher cost of fuel and more fuel needed due to an increase in biofuel use will cause a behavioural rebound effect where drivers decrease their km's and thus fuel consumption.

Variable resource cost of conventional (fossil) fuels

BERR have published the latest government Oil price assumptions and include low, central, high and high-high scenarios[5]. The oil price assumptions to 2030 have been converted into petrol and diesel costs using DECC-DfT's fuel price forecasting model. The variable resource cost of petrol and diesel price forecasts under each oil price scenario are given in table 7 below and can be found in the Department of Energy and Climate Change's Greenhouse Gas Policy Evaluation and Appraisal in Government Departments:

http://www.defra.gov.uk/environment/climatechange/uk/ukccp/pdf/greengas-policyevaluation.pdf

Resource cost of Renewable (bio) fuels

The resource cost of biofuels will depend on where the biofuels for UK consumption are supplied from. Given some of the uncertainty over the potential sources and costs of UK consumed biofuel <u>it has been assumed that the current average variable cost of bioethanol is 40ppl and biodiesel 50ppl.</u>

Future costs of biofuels are even more uncertain and will depend on the developments in the oil, biofuel and agriculture markets and the interactions between these. These are three highly uncertain markets and the complex interactions between them amplify the uncertainties in future biofuels costs. These markets and the impacts on the prices of biofuels need to be studied more as they are complex and are interconnected – a brief description of these are provided below. Due to these complexities and uncertainties we have assumed three biofuel cost scenarios for all oil price scenarios for analytical simplicity. These should not be taken as the maximum of the potential biofuel prices, but an illustration of the potential range. More research is required to better define the potential costs of biofuels.

Biofuel price driving factors:

Biofuel Market – this can be separated between the supply and demand of biofuels.

Demand and the willingness-to-pay for biofuels will be dependent on (i) government mandates for biofuels due to energy security and GHG savings and (ii) demand from private fuel suppliers which will be dependent on the price differential between fossil fuels and biofuels. The lower the

[5] http://www.berr.gov.uk/files/file46071.pdf

price differential between fossil fuels and biofuels the greater the potential long term demand will be.

Supply and cost of biofuels will be dependent on (i) the amount of investment and realised improvements in the technology and production of biofuels which will be partially dependent on the long term demand for biofuels, (ii) the price of oil which will be an input cost to biofuels and (iii) the cost and supply of the agricultural feedstocks used for biofuels.

Oil market – the long term oil price will impact on (i) the price of fossil fuels and (ii) the cost of biofuels through direct refining and transportation costs and the cost of feedstock production in the agricultural market. The oil market will directly impact on the costs of fossil fuels and biofuels and thus the price differential. The price of oil itself will in the long term be dependent on the demand for and supply of crude oil and processed fuels.

Agricultural Market – long term agricultural prices for biofuel feedstocks will impact on the cost of biofuels and the price differential. Agricultural prices will in the long term be dependent on the potential demand, supply and costs of producing agricultural feedstocks. Demand will be dependent on population growth, food tastes and demand for feedstocks from non-food industries. Supply will be dependent on available land, yields and the sustainability criteria set for biofuel feedstocks by governments. The costs of production will partially be dependent on the oil price as oil based fuel is an input cost to the production of feedstocks.

***Biofuel price scenarios*:**

The rationale behind each of the biofuel cost scenarios are described below and table 7 illustrates the price scenarios assumed in 2020.

Low Biofuel Cost – This scenario assumes that investment in biofuel technology and production reduces the cost of biofuels compared to current levels (in real terms). This also assumes that the feedstock prices reduce from their current high prices and that greater global demand does not significantly increase the price of biofuels in what develops to be a global competitive market. These are consistent with the Commission's biofuel price estimates in their Biofuel Progress Report and other publicly available projections.

Central Biofuel Cost – in this scenario biofuel pre-tax prices remain at current levels (in real terms). This scenario assumes that any improvements in biofuel technology and production are offset by higher agricultural prices and / or biofuels demand, or that the expected improvements in biofuel costs are not realised.

High Biofuel Cost – in this scenario biofuel pre-tax prices increase from current levels (in real terms). This scenario assumes that the expected improvements in biofuel technology and production are not realised and agricultural prices and increase demand for biofuel increase the pre-tax price of biofuels.

For the High-High Oil price/Central Biofuel cost scenario we have assumed that a consistent oil price of $150 provides incentives for enough investment to bring down the costs of biofuels. However, due to higher global demand from fuel suppliers the marginal resource cost of biofuels only reduce to the point where they are the same as fossil fuel costs on an energy equivalent basis (see energy penalty section below).

Table 7 below illustrates the pre-tax prices of fossil fuels and biofuels given the four oil price and three biofuel cost scenarios.

Table 7: Resource costs of Petrol, Diesel, Bioethanol and Biodiesel in 2020-21 (£/litre, 2008 prices)

Oil Price Scenario	Biofuel Price Scenario	Diesel	Biodiesel	Petrol	Bioethanol
Low	Low	£0.22	£0.40	£0.21	£0.30
	Central		£0.50		£0.40
	High		£0.60		£0.50
Central	Low	£0.31	£0.40	£0.29	£0.30
	Central		£0.50		£0.40
	High		£0.60		£0.50
High	Low	£0.41	£0.40	£0.37	£0.30
	Central		£0.50		£0.40
	High		£0.60		£0.50
High-High	Low	£0.61	-	£0.55	-
	Central		£0.55[1]		£0.36[1]
	High		£0.60		£0.50

[1] In the High-High oil price scenario we assume that the lowest that pre-tax biofuel price will fall is to the point in which they are equal to fossil fuel prices on an energy equivalent basis.

Energy Penalty of biofuels

A lower energy content has been factored in for all biofuel blends. Bioethanol has around 2/3 of the energy of petrol and biodiesel 9/10 of the energy of diesel. Because biofuels have a lower energy content it will take more fuel to travel the same distance, increasing fuel use and driving costs. While bioethanol, for instance, does have a higher octane content than petrol which would improve fuel efficiency, it has been assumed that the octane level of a petrol-bioethanol blend would be adjusted to be the same as in current petrol. Due to such adjustments, the additional properties of biofuels are not expected to improve the fuel efficiency and thus biofuels impact on fuel use is based on their energy content. Table 8 below illustrates the energy content of the different fuels.

Table 8: Energy content of fossil and biofuels (MJ/l)

	Energy content (mega-joules/ litre)	% of fossil fuel
Petrol	32.84	
Bioethanol	21.29	64.8%
Diesel	36.57	
Biodiesel	33.10	90.5%

Deadweight Welfare Loss due to higher driving costs

An increase in the cost of driving from a higher content of biofuel in the fuel mix will cause motorists to decrease the amount of km's travelled. This has been estimated using a price elasticity of petrol and diesel. A price elasticity of -0.25, falling to -0.15 by 2025, has been used in the analysis to take account of motorists responding to a fuel price increase. A decrease in driving km's is a cost to society as motorists are losing from the decreased km's travelled. This deadweight welfare loss has been estimated by multiplying the amount of less fuel used due to the price increase of petrol and diesel by the price increase, and then multiplying this by half.

Non-monetised Costs

Biodiversity and Land use change

There could potentially be biodiversity loss and GHG emissions from land use change with the increase of biofuel crop growth. There are great uncertainties in this area of analysis of biofuels as expressed in the Gallagher Review. One of the reasons for the slowdown in the obligation is to provide time to do more research on such indirect effects so they can be fully taken into account. Therefore this potential social cost has not been assessed at this time.

Food Prices

There could potentially be impacts on food prices with the increase of biofuel crop growth. There are great uncertainties in this market and the magnitude that biofuels could have on food prices. As with impacts on biodiversity and land use change, more research needs to be conducted to fully assess the wider impacts of biofuel consumption. Therefore this has not been assessed.

Monetised Benefits

Reduced Greenhouse Gas emissions

The benefits of renewable fuels are primarily their GHG savings compared with the use of conventional fossil fuel (petrol and diesel) – see Annex A. By increasing the uptake of biofuels there will be a reduction in GHG emissions. The estimates of greenhouse gas emission savings from biofuels have not taken indirect factors into account due to limited knowledge on the full impact that these factors may have, therefore there is uncertainty about the GHG savings these biofuels provide.

The GHG emission savings from the use of renewable fuels are usually quantified as net emissions i.e. an estimate of the GHG emissions from the production and combustion of the renewable fuel versus the relative production and combustion emissions of conventional fossil fuels on a well-to-wheel (lifecycle) estimation. Thus, if a renewable fuel is produced, for example, using little fossil fuel derived energy and fertilizers, it might provide 85% net emission savings relative to conventional road fuels – that is it only emits 15% of the GHG emissions that a conventional fuel does. If it is produced using a lot of fossil fuel, it might provide only 25% net emission savings - emitting 75% of the GHG emissions that conventional fuel does.

There can also be a significant variance in the net emission savings associated with renewable fuels depending upon the feedstocks and processing technologies used. Given this uncertainty, we have used two GHG saving scenarios: a 50% lifecycle GHG emission saving and a 20% lifecycle GHG emission saving. So far in the current obligation year the average GHG savings of the biofuels consumed has been near 50%. However, as the indirect impacts of biofuels are not fully taken into account in these well-to-wheel assessments and given the uncertainties around them, we have also used a lower GHG saving rate of 20% as an illustrative example of the potential GHG savings for this analysis. This is not to suggest that this analysis believes that indirect impacts will be 30%, but the use of the 20% figure is purely used as a comparative assumption for illustrative purposes only. The estimated GHG emission savings were monetised using Defra's shadow price of carbon.

http://www.defra.gov.uk/environment/climatechange/research/carboncost/index.htm

Ancillary impacts - Air Quality

Although the ancillary impacts in the summary sheet are listed in the non-monetised benefits box, these have been monetised, but are not presented in the headline present value benefit estimation, although they are included in the net present value estimation.

The main ancillary impact is that on air pollutant emissions. The higher cost and lower energy content of biofuel increases the cost of driving as is discussed in other parts of this IA. The increase in driving costs causes a reduction in km's driven which intern reduces the amount of air pollutants emitted. The value of this has been estimated and uses Defra's Air Pollutant Damage Cost estimates, which can be found:

http://www.defra.gov.uk/environment/climatechange/uk/ukccp/pdf/greengas-policyevaluation.pdf

There is additional complexity in the impact on air quality with the use of biodiesel. Current research suggests that biodiesel increases the amount of nitrogen oxides (NO_x) emissions compared to diesel, but results in a decrease in particulate matter (PM) emissions. Each of these impacts have also been estimated for each of the scenarios. Using Defra's air quality damage costs it was found that the benefit in the decrease in PM emissions more than offset the cost of the increase in NO_x emissions.

Non-monetised Benefits

Increased fuel security

Increasing the use of biofuels may result in a reduction in the sourcing of UK transport fuel consumption from other countries and/or vary the sourcing of fuel from abroad.

Innovation

Increasing the use of biofuels may have positive impacts on innovation as new and cheaper ways of producing biofuels and improving carbon savings are developed.

Congestion

An increase in pump prices is likely to have some impact on the amount people drive and may therefore result in a small decrease in traffic congestion. This has not been quantified for this impact assessment.

Other Assumptions

• Obligated fuel suppliers are likely to pass cost savings on to their customers in the UK and thus 100% cost pass-through has been assumed.

▪ Demand forecasts for road fuel consumption are from the Dft National Transport Model.

▪ A discount rate of 3.5% is assumed for every year to present estimates in net present terms. This is consistent with The Green Book (http://www.hm-treasury.gov.uk/greenbook).

Distributional Analysis

The distributional analysis presented in the tables 2.1 to 2.4 above attempt to estimate the impacts that the options will have on consumers, firms and the government.

Consumers

This includes the impact of:

- Change in the cost of road fuel (including fuel duty and VAT),
- Change in consumer surplus from changes in fuel costs,
- Changes in air quality,
- Changes in CO_2 emissions.

Firms

This includes the impact of:

- Change in the cost of road fuel (including fuel duty but not VAT),
- Change in firms' consumer surplus from changes in fuel costs.

Government

This includes the impact of:

- Change in tax revenues.

Specific Impact Tests: Checklist

Use the table below to demonstrate how broadly you have considered the potential impacts of your policy options.

Ensure that the results of any tests that impact on the cost-benefit analysis are contained within the main evidence base; other results may be annexed.

Type of testing undertaken	***Results in Evidence Base?***	***Results annexed?***
Competition Assessment	No	Yes
Small Firms Impact Test	No	Yes
Legal Aid	No	No
Sustainable Development	No	No
Carbon Assessment	Yes	No
Other Environment	Yes	No
Health Impact Assessment	No	No
Race Equality	No	Yes
Disability Equality	No	Yes
Gender Equality	No	Yes
Human Rights	No	Yes
Rural Proofing	No	Yes

Annexes

Annex A – Specific Impact Tests

Competition Assessment

The UK oil market is highly competitive. Traditionally it has been dominated by the UK's major oil companies, but in recent years the 'independents', have gained market share, particularly in the retail sector. In particular the sector has been affected by the entry into the market of the major supermarkets which has intensified competition. The independents have led on the introduction of biofuels into the UK market, with the supermarkets in particular increasing the availability of biofuels at the retail end of the market.

The biofuel market in the UK is very new and makes up a very small proportion of overall fuel sales. The majority of biofuel sales are currently from imports, brought in by the independents, but there is also growing UK capacity, particularly for biodiesel. This currently consists mostly of a small cottage industry, but major plants are in operation and a number of others are in the development or construction stages.

Measures to promote biofuels further are likely to further develop and mainstream the biofuel market in the UK, and lead to both increased imported biofuels and domestic capacity. As with any new and emerging market, the cottage industry is likely to be replaced in time with large scale industry. This should return benefits from economies of scale and investment capacity for technological developments.

So far in the current obligation year (2008-09) the UK industry has supplied 8% of the biofuel consumed in the UK, the majority of which has been biodiesel (2/3's of the UK market). There is still much room for UK industry expansion within the biofuel market and the slowdown of the obligation should not restrict the domestic sectors growth – neither for the bioethanol nor biodiesel producers.

Overall, despite the slowdown of the RTFO, the 5% target in 2013-14 with the expected European 2020 targets should still give incentive to the biofuels industry to invest in new technology and domestic capacity. A 5% biofuel obligation will still occur, but it will be achieved in 2013-14 rather than in 2010-11. Thus the final level of investment in technology and capacity is not expected to be significantly affected, but there may be differences in the short to medium term in how fuel suppliers meet the obligation. It is not anticipated that the effects of a slowdown in the obligation would negatively affect the competitiveness of the fossil fuel or emerging biofuel markets in the long term.

Small Firms Impact Test

There are three types of small firms impacted by the RTFO:

• Small firms that retail petrol through one or more forecourts;
• Small renewable fuel producers; and
• Farmers producing crops for fuel (feedstock).

The renewable fuel producers and the producers of feedstock crops should see an expanded market for their products resulting from the amendment of the definition of 'relevant hydrocarbon oil'. Biofuel sales could increase and the obligation ensures a level of demand at that level for future years. Most of this fuel will be sold to be blended into petrol and diesel by the major oil companies, who will be able to choose how they source their fuels, which may include importing. Nevertheless, this represents a significant opportunity for both small farmers and biofuel producers.

So far in the current obligation year (2008-09) the UK industry has supplied 8% of the biofuel consumed in the UK, the majority of which has been biodiesel (2/3's of the UK market). There is still much room for UK industry expansion within the biofuel market and the slowdown of the obligation should not restrict the domestic sectors growth – neither for the bioethanol nor biodiesel producers. It is not anticipated that the effects of a slowdown in the obligation would negatively affect the small firms from the agricultural or biofuels industry in the long term.

Other Impact Tests

As far as possible, this impact assessment has tried to assess the impact of the amendment to the order on GHG emissions, the environment, health and sustainable development. Where there are still uncertainties we have tried to highlight these and recognise that more information and research is needed.

Impacts on other areas of society have also been assessed and it has been found that this amendment to the order will have no significant disproportional impact on Race Equality, Disability Equality, Gender Equality, Human Rights or the Rural Community.