Department for Transport

Renewable Transport Fuel Obligation

Draft Post-Implementation Review

December 2013

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Department for Transport
Great Minster House
33 Horseferry Road
London SW1P 4DR
Telephone 0300 330 3000
Website www.gov.uk/dft

General email enquiries FAX9643@dft.gsi.gov.uk

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Executive summary

Introduction

1. The Government is committed to tackling climate change, and we have a comprehensive package of policies and legal commitments in place to enable us to do this. Through these we aim to make the transition to a low carbon economy, driving down emissions whilst maintaining energy security, becoming less reliant on imported fossil fuels, and minimising costs to consumers.

2. Transport makes up a large proportion of our domestic greenhouse gas emissions (21% by source in 2010)[1], and reducing these requires a step change in technology and investment. Sustainable biofuels can deliver substantial reductions in emissions from transport and have an important role to play in the transition to a low carbon economy.

3. The Renewable Transport Fuel Obligation (RTFO) was introduced in April 2008 to support the supply of sustainable biofuels in the UK, and to meet our European obligations. The RTFO implemented the EU Biofuels Directive and requires fuel suppliers to ensure that a minimum proportion of their transport fuel is from a renewable source.[2]

4. The RTFO was amended extensively in 2011 to implement the EU Renewable Energy Directive (RED).[3] This gave greater certainty over the sustainability of biofuels by introducing mandatory sustainability criteria, as well as incentivising non crop biofuels by introducing 'double counting' for those derived from wastes and residues. At the same time further amendments were made to implement the EU Fuel Quality Directive by including a reporting requirement on emissions of fossil fuels and extending the scope of the obligation to include fuels used in non-road mobile machinery (NRMM).[4] Further amendments are expected to address Indirect Land Use Change (ILUC) following the outcome of European negotiations.

5. As part of government's overall commitment to improving regulation and to reducing the burdens it imposes, ministers committed to reviewing the effectiveness of the RTFO amendments by April 2014 in a Post Implementation Review (PIR). The scope of the review covers the extent to which the RTFO has achieved its objectives, to assess costs and benefits, and to identify any unintended consequences. In addition, the review is intended to consider how implementation and enforcement could be improved.

[1] https://www.gov.uk/government/publications/total-greenhouse-gas-emissions-from-transport
[2] Directive 2003/30/EC
[3] Directive 2009/28/EC
[4] Directive 2009/30/EC

6. This document sets out an initial draft PIR and we invite comment and input from businesses, individuals and other organisations. It includes analysis of the RTFO over the period since its inception and invites further evidence as to whether current policy is delivering the desired outcomes. Specific questions are listed at the end of each chapter. The final review is due for publication in April 2014.

Draft conclusions

To what extent has the policy achieved its objectives?

7. The RTFO was intended to:

- increase the supply of biofuels in line with Government targets; and
- achieve carbon savings in transport.

8. The amendments to the RTFO in 2011 were intended to:

- improve sustainability outcomes; and
- incentivise the supply of non-crop biofuels by 'double counting' biofuels derived from waste and residues.

Biofuel supply

9. The RTFO has been successful in moving biofuel supply from a niche activity to a normal business operation for all major UK suppliers of road fuels, and production capacity has increased significantly over the life of the policy. The obligation percentage has increased from 2.5% to 4.75% and the vast majority of suppliers have met their obligations every year through the supply of biofuels rather than buying out.

Carbon reduction

10. In Year 5 so far the RTFO achieved carbon savings of around 1.6 mtCO2/year (equivalent to taking around 600,000 cars off the road), even when the wider 'indirect' (i.e. ILUC) impacts of biofuel production are taken into account. Although this is lower than the 2.7 mtCO2/year originally anticipated by this stage in the RTFO's lifetime, it reflects a lower supply of biofuels than originally intended because Government has held back from increasing targets pending the outcome of EU negotiations on ILUC. With ILUC taken into account, UK supplied biofuels are currently delivering an average of 56% less carbon emissions compared to the equivalent fossil fuels.

Sustainability

11. Following the amendments to implement the RED, 99% of biofuel has been certified as being sustainable so far in Year 5 of the obligation. Double certification of waste derived fuels has maintained an effective incentive for the use of waste derived fuels, which accounted for 50% of supply in Year 4 and 39% so far in Year 5.

What have been the costs and benefits of RTFO implementation?

12. The RTFO has been effective overall at reducing carbon emissions, though the available measures to reduce emissions in transport remain relatively more expensive than those available in other sectors. Under the RTFO the cost of carbon abatement is around four times that of the Government's benchmark value to evaluate cost effectiveness of carbon abatement measures of this kind. At the time the RTFO was set up, controls were put in place to protect the consumer by limiting the extent to which these costs could be passed on at the pump. This cap is currently 1.76 pence per litre, whilst current costs are less than half that, at 0.8p per litre (which equates to around an additional £8 per year on the average car's fuel bill). However, it should be noted that biofuel policy is part of a wider package of measures to reduce CO2 emissions in transport which has had the combined effect so far of saving the average motorist £35 per year, more than offsetting the cost impact of biofuels. The costs of administering the obligation have been reduced significantly over the period, by some 40% over baseline.

Industry

13. The effects on industry are mixed. Market share for small suppliers has been broadly maintained over the period while the number of small firms has reduced. Some suppliers have diversified into other areas whilst some have gone out of business. Overall there has been significant consolidation and a move away from a cottage industry to large scale commercial supply. Overall UK production capacity has increased.

Have there been unintended consequences?

14. The UK has been at the forefront of countries in the world to press for consideration of indirect effects of biofuel production. At the time the RTFO was being implemented in 2008, scientists were questioning whether the lifecycle methodologies used for biofuels appropriately reflected their net effect on GHG emissions. The UK's Gallagher Review concluded that crop derived biofuels could 'indirectly' cause expansion of agricultural production onto carbon rich land.

15. Amendments to implement the RED requirements have helped to reduce the ILUC effects of fuel supply under the RTFO. Encouraging the use of waste derived biodiesel over crop derived biodiesel has helped to ensure that the RTFO currently offers significant carbon savings. The Government has pressed for effective action on ILUC while further amendments to control for ILUC effects are negotiated in Europe. In the meanwhile, the Government has held back in setting higher targets, which could see a return of higher levels of crop based biodiesel.

Is Government intervention still required? Or has the market changed as a result of the policy?

16. Sustainable biofuels are an effective means of reducing carbon emissions from transport, but on a per unit basis, they remain more expensive than fossil fuels. If their use is to be supported, the need

remains for an effective mechanism to ensure supply and to meet our European obligations. Without Government intervention we would expect the quantity of biofuel supplied to fall dramatically.

What is the scope for simplification or improvement?

17. The regulatory framework of the RTFO has become more complex over time in attempts to ensure that biofuels supplied offer the benefits underpinning Government support. Legislative proposals are under discussion at European level intended to improve the regulatory framework to address ILUC sustainability concerns. If agreed these may add further complexity to the regulatory framework.

18. The main calls from industry to improve the RTFO have been to set a target supply trajectory towards the RED target of 10% in 2020 to provide greater certainty. Smaller producers have called for a variety of measures to increase support for UK UCO supply. Policy development in this area would need to be assessed against the criteria set out in the Bioenergy Strategy, aimed at making a cost effective contribution to UK carbon emission objectives by maximising the overall benefits and minimising costs. The Department welcomes suggestions for improving the RTFO and how the improvements meet these criteria.

Do compliance levels indicate that the enforcement mechanism chosen is appropriate?

19. The RTFO has been operated using risk based enforcement mechanisms, and compliance has generally been good. One supplier has been issued with a civil penalty for failing to meet their obligation and a small number of suppliers have been issued with civil penalties for late registration with the scheme. The vast majority of suppliers have met their obligations in full each year. Concerns emerged about whether all of the used cooking oil supplied in Year 4 was genuine, and as a result, changes were made by the Administrator to introduce a tighter compliance policy.

How to respond

Comments and evidence are invited on the draft review from 16 December 2013 to 7 February 2014. These will be taken into consideration in the final PIR which will be published in April 2014.

The documentation is available from the Gov.UK website or you can contact Taj Gul (taj.gul@dft.gsi.gov.uk) if you would like alternative formats (Braille, audio CD, etc).

Responses are invited using the response template which should be emailed to biofuel-sustainability@dft.gsi.gov.uk

Initial results from the review will be presented at the next Low Carbon Fuels stakeholder workshop in 15 January 2014 at Great Minster House, Horseferry Road in London. If you would be interested in attending this event, please email biofuel-sustainability@dft.gsi.gov.uk

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Information provided in response to this call for evidence, including personal information, may be subject to publication or disclosure in accordance with the Freedom of Information Act 2000 (FOIA) or the Environmental Information Regulations 2004.

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1. Renewable Transport Fuel Obligation review

Introduction

1.2 This document forms the draft post-implementation review (PIR) of the Renewable Transport Fuel Obligation (RTFO).[5]

1.3 The RTFO is one of Government's main policies for reducing greenhouse gas (GHG) emissions from road transport. It commenced on 15 April 2008 and is intended to deliver GHG savings by encouraging the supply of renewable fuels. The RTFO was amended extensively to implement the sustainability criteria of the EU Renewable Energy Directive (RED) from 15 December 2011.[6]

1.4 The regulatory impact assessments (RIAs) accompanying the amending legislation contain a requirement to conduct a PIR of whether the amendments have achieved their objectives by April 2014. PIRs should also assess costs and benefits of regulations and identify whether they are having unintended consequences.[7]

1.5 Given that the RTFO has been in place since 2008, in line with best practice, this PIR considers the RTFO overall and whether it is achieving its intended objectives. This includes whether recent changes have worked as intended, for example, whether the introduction of double counting incentivised the supply of biofuels produced from wastes and residues.

1.6 In this review the impacts of the RTFO have been assessed against a counterfactual state of the world where only fossil fuel is supplied.

Background to UK biofuels policy

Fuel duty incentives

1.7 Prior to the RTFO, biofuels were incentivised through reductions in fuel duty relative to fossil fuel. In July 2002, the Government introduced a duty incentive of 0.20p/litre below regular diesel fuel for biodiesel. A similar incentive for bioethanol began on 1 January 2005. The first two fiscal years of the incentive made limited impact on biofuel supply: in this period biofuels made up just 0.04-0.06% of total UK fuel sales.

[5] https://www.gov.uk/renewable-transport-fuels-obligation
[6] Directive 2009/28/EC
[7] Extract taken from the Department for Business, Innovation and Skills document *Better Regulation Framework Manual* (March 2013).

1.8 Duty incentives were announced on a rolling three year basis to provide some certainty for investors. However, there were concerns that:

- the duty incentive promised for three years still did not provide sufficient certainty to stimulate the market;
- the 20p/litre value was insufficient to cover the increased costs of biofuels;
- the duty incentive did not guarantee that a desired level of biofuel sales, and hence carbon savings, would be achieved.

The Renewable Transport Fuel Obligation

The original regulations

1.9 The RTFO, as introduced in April 2008, set targets for increasing the use of renewable fuels in UK road transport with the aim of reducing carbon emissions. The obligation started at 2.5% (by volume) in 2008/09 and increased in 0.5% increments to 5% in 2010/11. It was expected to overcome limitations of the duty incentive and provide a more certain framework to secure a mainstream market.

1.10 The RTFO was also the UK's mechanism to meet the EU Biofuels Directive which required Member States to set targets for biofuels uptake.[8]

1.11 The RTFO regulations require suppliers of 450,000 litres or more of fuel per annum ('obligated suppliers') to ensure that a minimum proportion of their transport fuel was from a renewable source. Each year obligated suppliers have to demonstrate that they have met their obligation by redeeming a number of Renewable Transport Fuel Certificates (RTFCs) equivalent to the volume of biofuel they were obliged to supply.

1.12 Each litre of biofuel or kilogram of biogas supplied across the UK duty point was awarded one RTFC. RTFCs can also be obtained by non-obligated suppliers of biofuel who can trade them with obligated suppliers, who in turn can use them to meet their obligations.

1.13 Obligated suppliers also have the option to 'buy out' their obligation, paying a fixed fee per litre of biofuel that would otherwise need to have been supplied to earn RTFCs. This acts as a means of protecting the market, and ultimately the fuel consumer (assuming cost would be passed to the fuel pump) should the additional marginal cost of supplying biofuel relative to fossil fuel exceed 35 pence per litre (taking into account the duty incentive).

1.14 All suppliers who wished to receive RTFCs were required to report carbon and sustainability data on the biofuels supplied, such as: information on the feedstock; country of origin; previous land use (for crop based feedstocks); whether the fuel met a sustainability standard; and the greenhouse gas emissions. It was also a requirement for this data to be verified. However, reporting 'unknown' was permitted and RTFCs were awarded regardless of the carbon and sustainability data.

[8] Directive 2003/30/EC

Indirect effects of biofuels

1.15 Following the introduction of the RTFO, concern grew about the wider impacts of biofuels on sustainability. New studies indicated that 'indirect land use change' (ILUC) could result from increased demand for crops used to make biofuel, and this could have a negative effect on greenhouse gas emissions, undermining the effectiveness of biofuels as a carbon reduction tool. In the light of the new evidence, targets under the RTFO were re-profiled to reach 5% in 2013/14[9]. In addition, the UK was one of the Member States that ensured a review mechanism was included in the EU Renewable Energy Directive (RED) to assess indirect effects and bring forward proposals if necessary to address the issue.

1.16 Negotiations on a European Commission proposal to address indirect effects are currently live.

2011 Amendments to implement the Renewable Energy Directive

1.17 The RTFO was amended in December 2011 to implement the requirements of the EU RED. The key change was the introduction of minimum requirements for carbon saving and sustainability of biofuel supply. These are that:

- Biofuels must achieve at least a 35% greenhouse gas emissions saving (this threshold rises to 50% or 60% over time for 'old' and 'new' installations, respectively)[10];
- Biofuels may not be made from raw material obtained from land with high biodiversity value in or after January 2008;
- Biofuels may not be made from raw material obtained from land with high carbon stock such as forests or land that was undrained peatland in January 2008 unless strict criteria are met.

1.18 Biofuel that does not meet these sustainability criteria is counted as fossil fuel and accrues an obligation to supply sustainable biofuel, in the same manner as any other fossil fuel.

1.19 Another significant change is that in order to receive RTFCs, biofuel suppliers must submit carbon and sustainability data which demonstrates that the mandatory sustainability criteria have been met, together with an independent assurance report over that data. Verification must be in accordance with the International Standard on Assurance Engagements (ISAE 3000). The RTFO Administrator must be satisfied that the data is accurate before issuing RTFCs.

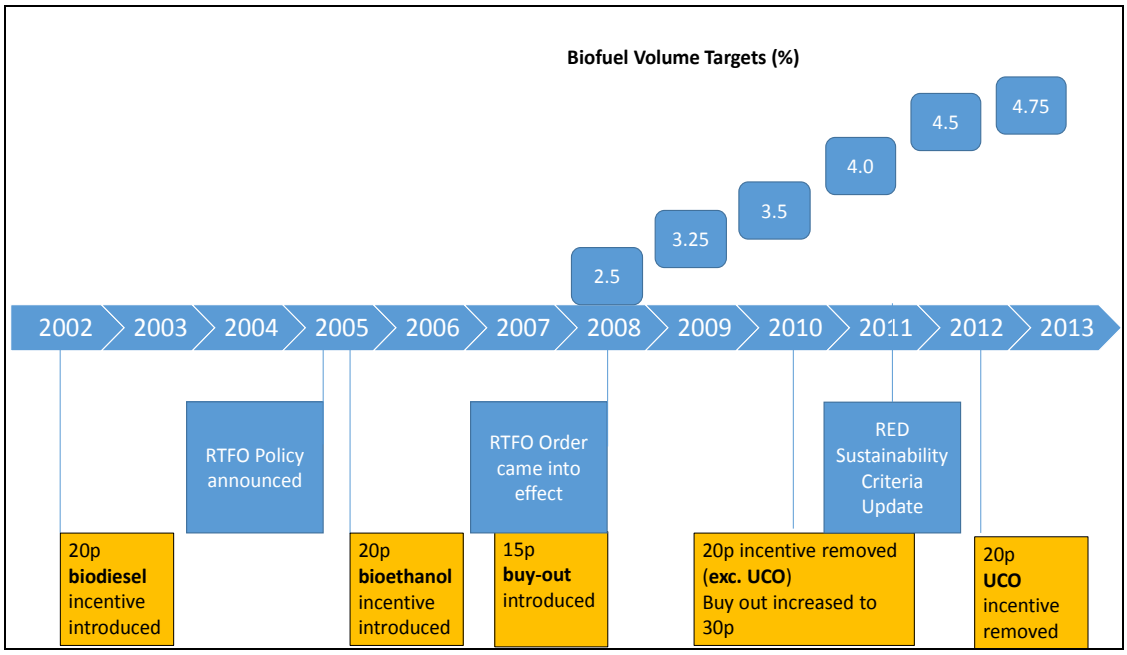
1.20 Suppliers must apply for RTFCs at least annually in order to receive RTFCs on that year's supply, but may choose to do so more frequently (up to monthly). This option was included to help cash-flow for suppliers

[9] The obligation level was adjusted in 2013 to 4.75% in order to maintain the overall level of biofuel supply, once the RTFO scheme was expanded to include fuels used in non-road mobile machinery, and for other end uses covered by the Fuel Quality Directive.
[10] Under the 'grandfathering clause' biofuels produced in installations that were already operational on 23 January 2008 did not have to meet the 35% threshold until 1 April 2013.

and to enable suppliers to monitor their progress towards meeting their obligations.

1.21 A further change introduced to incentivise biofuels with a low risk of indirect effects is the 'double counting' towards targets of biofuels derived from specified wastes and residues (and ligno-cellulosic and non-food cellulosic feedstocks). These biofuels receive two RTFCs per litre of biofuel or kilogram of biogas. These biofuels (with the exception of agricultural, aquacultural, fisheries[11] and forestry residues) will also be considered to have automatically met the land use criteria (i.e. preservation of biodiversity and carbon stocks). Their carbon intensity must still be reported and must meet the GHG savings threshold.

Figure 1.1 Policy timeline



What were the intended effects of the RTFO?

Original impact assessment

1.22 In the impact assessment for the legislation which first introduced the mechanism, the RTFO was intended to reduce carbon emissions from road transport by 2.6 – 3.0 million tonnes of CO_2 emissions[12] per year. The GHG savings would contribute to meeting the UK's international obligations under the Kyoto agreement. This would be achieved by obliging road transport fuel suppliers to ensure that 5% of the fuel they supply comes from renewable sources by 2010/11.

1.23 It was noted that existing intervention in the form of a duty derogation for lower carbon fuels such as biofuels had a limited impact on levels of supply. The market would not automatically increase supply because of

[11] In many cases materials from aquaculture and fisheries will automatically meet the land based criteria because these materials are not usually sourced from the land.
[12] This equates to 0.7-0.8 million tonnes of carbon.

the additional costs of supplying biofuels compared to fossil fuels. The RTFO was intended to provide increased confidence to investors through long term support for the market.

1.24 The introduction of tradable certificates to meet supplier obligations was anticipated to provide some financial benefit to those biofuel suppliers in a position to earn certificates. Suppliers, and ultimately fuel consumers, would be protected should the cost of biofuels increase to 35 pence per litre or more relative to fossil fuel by the option for suppliers to 'buy-out' of their obligations. The most the pump price was anticipated to increase as a consequence of the RTFO was 0.75ppl, plus VAT, if suppliers opted to buy-out. This might rise up to 1.5ppl plus VAT once the obligation level reached 5%.

1.25 It was intended that the RTFO should also encourage the UK biofuels industry to source relevant feedstocks in the farming sector; produce biofuels in the chemical and refining sectors; and develop technologies to improve the performance and production of biofuels.

1.26 Anticipated key non-monetised benefits include market / employment opportunities in agriculture and biodiesel production; diversity and security of national fuel supply; a likely positive impact on innovation; and possible positive impact on congestion.

1.27 It was also noted that the RTFO would encourage biofuels that come from sustainable sources and those that offer substantial carbon savings, with the aim of moving to a system that only rewarded sustainable fuels and directly awarded carbon savings.

2011 amendments impact assessments

1.28 For the RTFO amendments, there were five RIAs covering the following:

- Overarching impacts;
- Double certification of waste-derived biofuels;
- Verification;
- Minimum sustainability criteria; and
- Partially renewable fuels.

1.29 The overarching regulatory impact assessment for the 2011 update to the legislation stated that the amendments were intended to:

- improve the sustainability characteristics of biofuel supplied under the RTFO by introducing minimum mandatory sustainability criteria and double rewards for certain biofuels less likely to have negative indirect impacts;
- encourage the development of 'second generation' advanced biofuels and waste-derived biofuels which do not use food as feedstock; and
- provide obligated suppliers more flexibility in meeting their obligation under the RTFO at least cost by bringing partially renewable fuels within the scheme.

1.30 It was also noted that the RTFO aims to increase the use of renewable energy in the transport sector, in a cost effective way. However, the introduction of mandatory sustainability criteria might increase pump prices by around 0 to 0.4ppl (including VAT) over the period 2012 to 2020 in the central of three potential modelled cost scenarios.

1.31 Key non-monetised benefits were expected to include possible increased security of national fuel supply; potential small ancillary benefits arising from a possible reduction in driving, including congestion, air pollution, noise, road infrastructure and accidents; market / employment opportunities in UK agriculture; and production of more sustainable biofuels.

1.32 It was noted that ILUC might mean that lower GHG savings were delivered than intended, but that the impacts were not sufficiently well quantified or understood to be able to be incorporated into GHG calculations at the time.

Structure of this document

1.33 This draft PIR contains chapters covering the key aspects of the RTFO:

- Biofuel supply
- Greenhouse gas savings
- Costs and cost effectiveness
- Minimum sustainability criteria
- Double counting and wastes
- Industry impacts and economic effects
- Wider effects

1.34 Each chapter considers the anticipated impact set out in the original and 2011 amendments impact assessments. The performance of the RTFO over the first five years is analysed in terms of how it fits against the expected outcomes.

1.35 The methodology and assumptions underlying the economic and greenhouse gas analysis for the report is included at Annex A

1.36 To inform the review the Department commissioned three reports to understand certain impacts the RTFO has had on the market. These are published in draft alongside the main report and comprise:

- Ecofys report on the UK biofuel industry
- Ecofys update report on status of tallow market
- Ecofys report on trends in the UCO market

1.37 The Department invites comments on the draft report and supporting evidence. These will be taken into consideration in the final PIR which will be published in April 2014. Questions on specific topics are included throughout the document. Electronic submissions are invited through our online survey.

2. Biofuel supply

Introduction

2.1 The RTFO was intended to achieve greenhouse gas emissions reductions by providing a mechanism to ensure that biofuels made up a proportion of UK fuel supply.

2.2 This section considers the extent to which the RTFO has ensured the intended supply of biofuel and where the biofuels have come from. The impacts of amendments made to the RTFO in 2011 on biofuel supplied under the RTFO are also considered here.

Original RIA expectation

2.3 The RTFO was intended to create a strong and stable market for biofuels in the UK. In 2007/08, immediately prior to the introduction to the RTFO, biofuels made up 1.1% of supply. The RTFO set a target for 2008/9 of 2.5% rising to 5% in 2010/11. At 5% it was expected to have created a demand for 2.5 billion litres of biofuel a year.

2.4 The assessment noted the opportunities the obligation presented for UK but did not estimate likely benefits for UK agriculture.

2011 RED amendments

Double counting

2.5 The amendments in 2011 to implement the RED did not change the targets set under the RTFO. The amendments did however introduce double certification of waste derived fuels, a measure intended to provide additional encouragement for these generally more sustainable fuels.

2.6 The impact assessment anticipated that the implementation of double counting would decrease the absolute volume of biofuel supplied under the RTFO, as two litres of crop derived biofuel would be displaced for each litre of waste-derived biofuel supplied. A detailed analysis of the impacts of double counting can be found in chapter 6.

Partial renewables

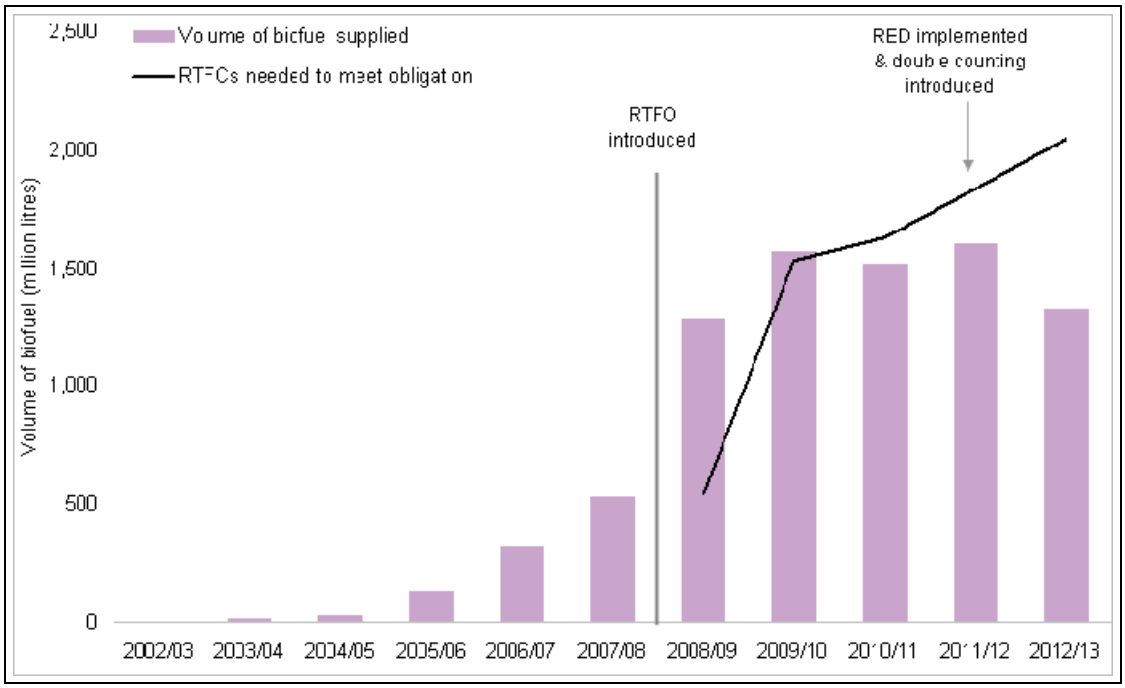
2.7 The 2011 amendments also included a provision to allow obligated suppliers to use partially renewable fuels (i.e. part bio, part fossil) to demonstrate compliance with the RTFO.

Supply against targets

2.8 The RTFO mechanism was intended to provide longer term support for biofuel supply than the duty incentive mechanism which it replaced. It sets targets that fuel suppliers have to meet (or pay the buy-out).

2.9 Figure 2.1 below shows actual supply over the period compared with the level of obligation set by the RTFO. It includes the period from 2002, when duty incentives began.

Figure 2.1: RTFO supply volumes[13]



2.10 Figure 2.1 illustrates the considerable increase in supply following the introduction of the obligation. Whilst it appears from the chart that actual supply varies somewhat from the obligation levels, all of the major suppliers have met their obligations in full in each year of the RTFO so far and have not bought out of their obligations.

2.11 The variation is due in part to the flexibility built into the RTFO that allows, for example, 'carry-over' of RTFCs issued for sustainable renewable fuel used in one year to be used to meet up to 25% of a supplier's obligation in the following year.

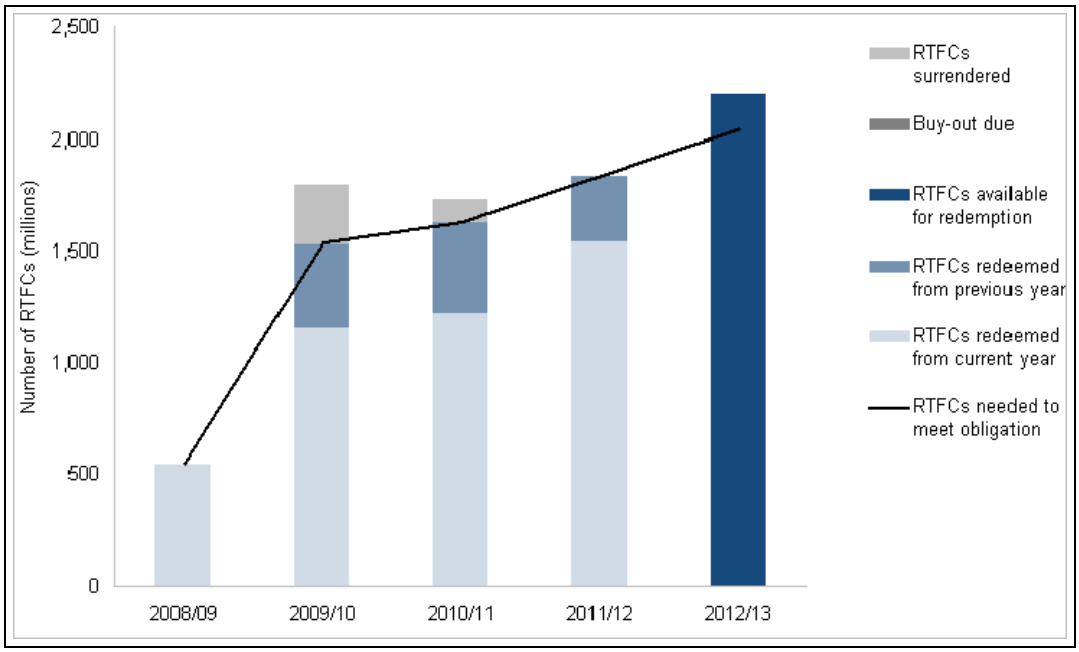
2.12 More significantly, Article 21(2) of the RED requires member states to "double count" biofuels derived from wastes and residues in national obligation mechanisms. In the RTFO this means that two RTFCs are issued per litre of waste / residue derived fuel supplied, and therefore a

[13]During the 2008/09 obligation year a drafting discrepancy was identified in the RTFO Order. This resulted in any fossil fuel which had biofuel blended into it being excluded from the obligation and resulted in an 'oversupply' against the legal obligation. This was corrected for the start of the 2009/10 obligation year.

supplier can meet their obligation with as little as half the volume of fuel indicated by the percentage obligation level. The effect of this can be seen in Year 5 of the RTFO that shows an overall reduction in supply so far against an increased obligation level, whilst suppliers over the RTFO as a whole are on track to meet their obligations. A reduction in the biofuel supply (resulting from certain biofuels receiving two certificates per litre) is in line with what was expected when double counting provisions were introduced to the RTFO (see chapter 6 for further analysis of double counting).

2.13 Figure 2.2. below illustrates the how the obligation has been met each year through the redemption of RTFCs. It demonstrates how the apparent 'gap' between actual biofuel supply and obligation level is met by RTFCs issued in the previous obligation year, and how there are more than sufficient RTFCs available to meet the 2012/13 obligation.

Figure 2.2: RTFCs used to meet the obligation[14]



2.14 A fuller analysis of double counted fuels can be found in chapter 6.

Type of biofuel

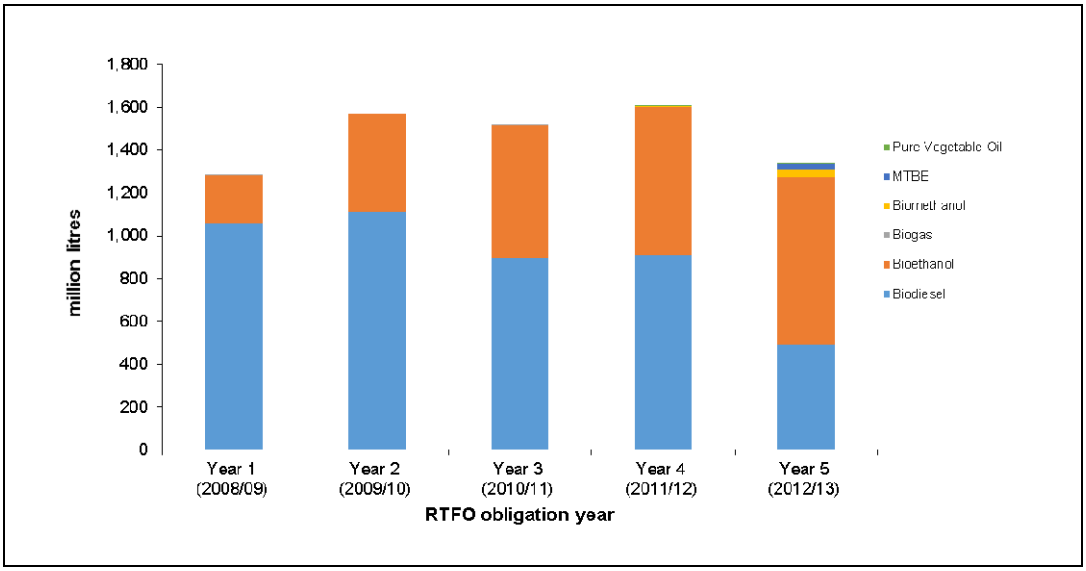
2.15 Figure 2.2 below shows the split of biodiesel and bioethanol over time. It illustrates a gradual but consistent shift towards ethanol. It also shows the emergence of partially renewable fuels and waste-derived biomethanol in Year 5. Under the RTFO, suppliers can choose to meet

[14]Note that individual suppliers can meet their obligation by redeeming RTFCs from the current or preceding obligation period or by paying the 'buy-out' price. In addition, RTFCs may be surrendered to obtain a share of any buy-out fund – these surrendered RTFCs are not counted towards meeting any obligation. The buy-out due includes both those who paid on time, those who paid late, and those who failed to pay and were issued with civil penalties.

their obligation through supply of any qualifying sustainable renewable fuel. This is intended to ensure that suppliers meet their obligations in the most economically efficient way, minimising the cost to consumers on a volume basis.

2.16 Unlike for biodiesel, the supply of bioethanol into the UK market required significant investment in logistical facilities due to handling issues with the fuel.[15]The RTFO successfully stimulated this investment. As bioethanol is typically cheaper (on a volume basis) to supply, suppliers have subsequently sought to maximise bioethanol alongside waste based biodiesel.

Figure 2.2: Total RTFO Biofuel Supply (split by fuel type)



2.17 There are limits to the amount of biofuel that can be blended with fossil fuels and still meet fuel quality requirements. Currently up to 5% bioethanol can be blended with petrol and up to 7% biodiesel with diesel for standard fuels suitable for use in all vehicles.

Partially renewable fuels

2.18 In December 2011 the RTFO was amended to allow the renewable portion of partially renewable fuels to qualify towards the obligation. As illustrated in Figure 2.2 above, during 2012/2013 small volumes of bio-MTBE (methyl tert-butyl ether) entered the fuel mix.

Biofuel feedstocks

2.19 Biofuels can be made from a variety of crops, and from biomass derived from wastes. The type of feedstock can make a significant difference to the carbon savings associated with different fuels. Since implementation of the RED in December 2011, the RTFO provides additional incentives

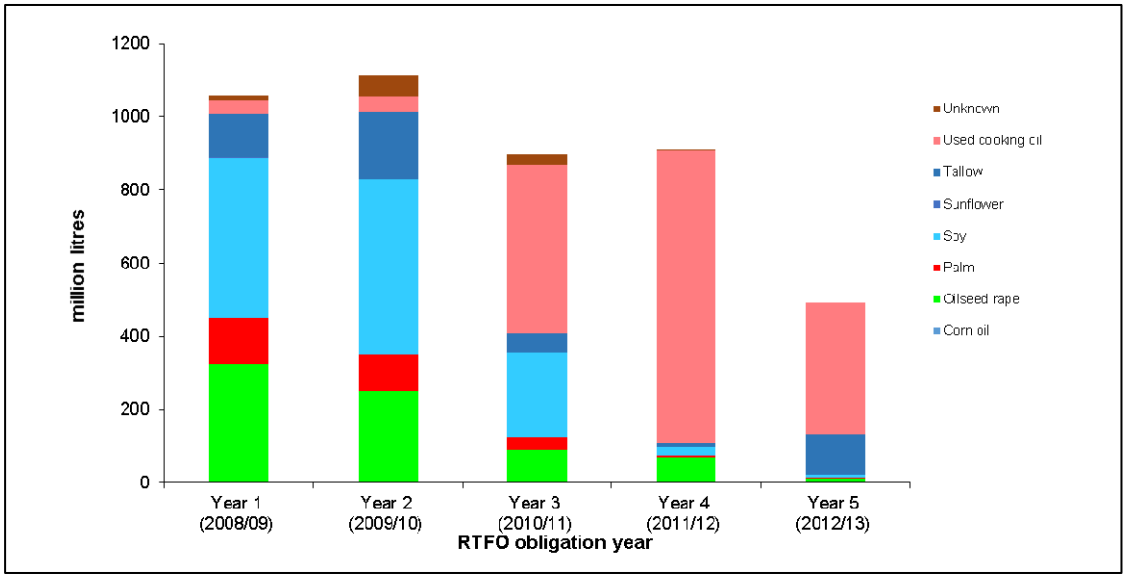
[15] Bioethanol is hydroscopic and thus cannot be supplied through underground pipelines used to transport fossil fuel products in the UK. Blending of bioethanol with petrol is carried out at 'racks' at refineries and fuel supply depots.

for waste derived biofuels, but does not otherwise discriminate between fuels on the basis of feedstock.

2.20 Biodiesel is made from oily crops and wastes. Figure 2.3 below illustrates the feedstock mix of biodiesel supplied under the RTFO over time. It illustrates the change from largely crop based materials, particularly soy and rape, towards used cooking oil.

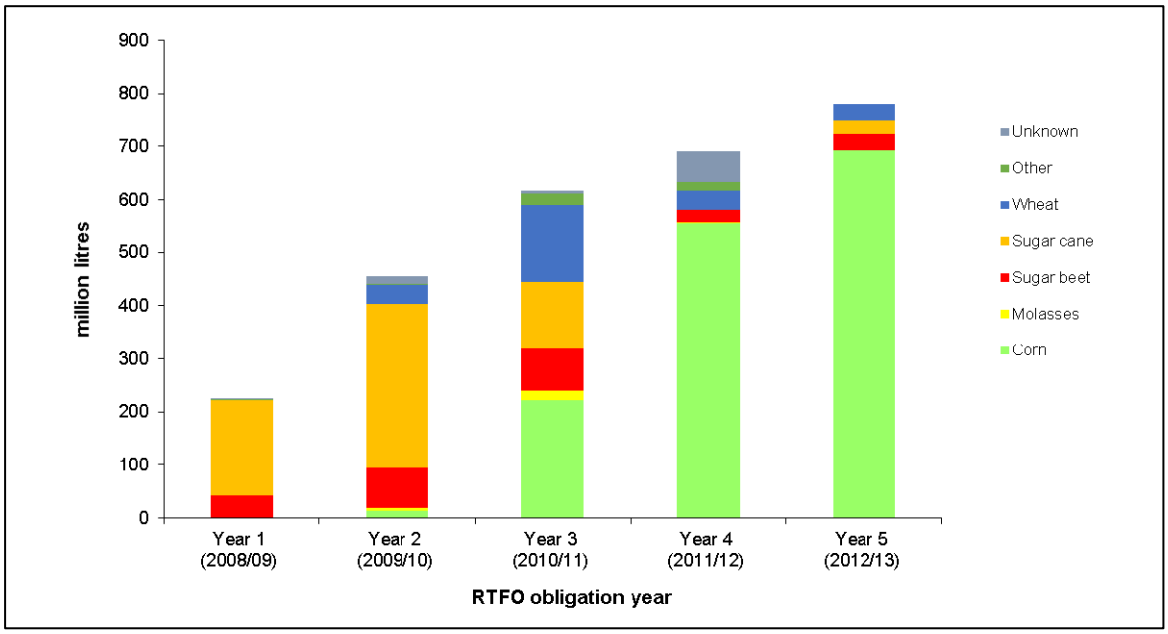
2.21 The large shift from crop-derived biodiesel to waste-derived biodiesel supplied under the RTFO has been driven by two separate policy interventions: (1) a fuel duty differential which provided an additional 20ppl incentive to supply UCO-derived biodiesel from April 2010 to April 2012 and (2) double certification of biofuels derived from wastes, residues, non-food cellulosic material and ligno-cellulosic material from December 2011 onwards (see chapter 6 on double counting for more detail).

Figure 2.3: Biodiesel supply (split by feedstock)



2.22 Bioethanol is made from starch or sugar rich crops. It can also be made from lignocellulosic materials and wastes, though this requires advanced technologies that are not yet commercialised. Figure 2.4 below illustrates a shift from largely sugar cane derived ethanol in the first few years of the RTFO to a market strongly dominated by corn ethanol.

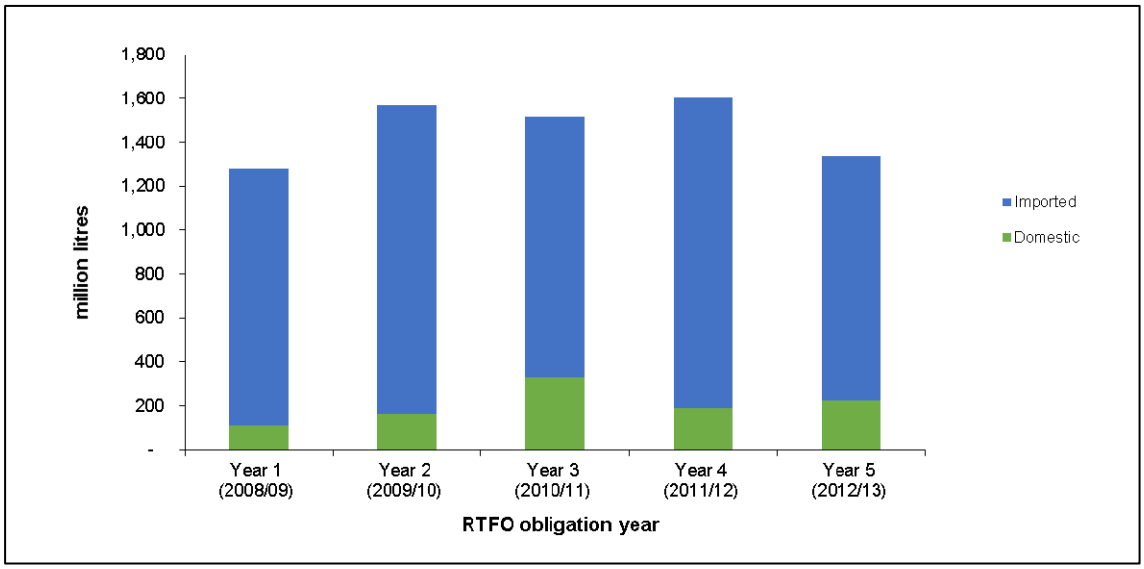
Figure 2.4: Bioethanol supply (split by feedstock)



Imports versus domestic feedstocks

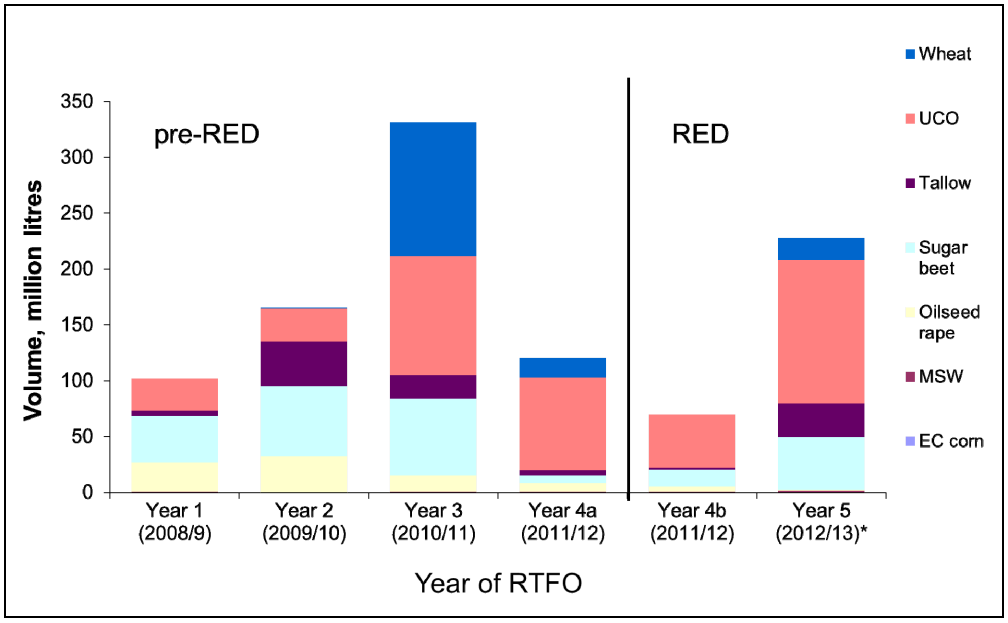
2.23 It was anticipated that the RTFO would provide benefits for UK farmers by providing a further market for their product. However, this was not a specific policy objective and these potential benefits were not monetised. Figure 2.5 illustrates the proportion of UK feedstock used to meet the obligation over time. As can be seen from the chart, the proportion of feedstocks grown or derived from UK sources has grown over the period, rising from 9% of biofuels supplied in Year 1 to 21% in Year 5.

Figure 2.5: Origins of biofuel supplied under the RTFO



2.24 Although overall UK feedstocks have increased over the period, the major and enduring increase has been from used cooking oil. As illustrated in Figure 2.6 below, sugar beet has been a consistently used feedstock, whilst rape oil has declined and the use of UK wheat has varied significantly.

Figure 2.6: UK feedstocks over time



Conclusion

2.25 The RTFO has been successful in significantly increasing the supply of sustainable biofuels in line with the obligation levels set. From 1.1% immediately before the RTFO was implemented to 3% so far in Year 5. The vast majority of suppliers have met their obligations in full in every year.

2.26 Over the period there has been a significant change in feedstocks and types of biofuels used to meet the obligation. Waste based biofuels made up12% of total biofuel supply in the first year of the obligation. This moved to 39% so far in Year 5, driven primarily by policy changes including double certification of waste based biofuels. The biofuel of preference has moved sharply from biodiesel to bioethanol, moving from 18% in Year 1 to 59% in Year 5, driven by primarily by economics as bioethanol is cheaper than biodiesel on a volume basis.

2.27 The proportion of feedstocks from UK sources has also grown over the period, from 9% in Year 1 to 21% in Year 5. As with the wider obligation, the mix of feedstocks is increasingly towards waste based fuels and ethanol feedstocks.

Questions

Q 2.1 Do you agree that the RTFO is an effective mechanism to ensure supply of sustainable biofuels in line with Government targets?

Q 2.2 Has the replacement of fuel duty derogations for biofuel with RTF certificates had a [positive / negative / neutral] effect on your business? Why?

Q 2.3 Do you have any further comments on the analysis in this chapter?

3. Greenhouse gas savings

Introduction

3.1 The primary policy objective for the RTFO is to reduce transport sector greenhouse gas (GHG) emissions. Biofuels offer the potential to reduce emissions by substituting a portion of petrol and diesel with renewable material derived from biomass.

3.2 This section considers the contribution that the RTFO has made over the period in the context of the Government's wider emissions reduction targets and the expectations in the original impact assessment.

3.3 The lifecycle GHG benefits of most crop derived biofuels are lower than they were understood to be in 2007 due to increased scientific understanding of the overall effects, in particular GHG emissions from indirect land use change (ILUC). Analysis is presented using both carbon savings estimates derived from the methodology in the current Renewable Energy Directive and more recent methodologies which seek to capture the impact of ILUC on GHG savings.

3.4 The amendment of the RTFO to introduce minimum greenhouse gas savings is also considered.

Carbon savings – 'Lifecycle' vs 'IPCC reporting' carbon accounting

Greenhouse gas (GHG) emissions from transport fuels can be accounted for in two different ways:

'Lifecycle' GHG savings metric refers to GHG savings which are assessed across the entire lifecycle of fuel production and use. This measure subtracts total GHG emissions associated with biofuel production and use (e.g. carbon sequestration during plant growth, agricultural emissions, refining emissions and combustion emissions) from total GHG emissions associated with fossil fuel production and use (e.g. extraction and refining emissions, combustion emissions) to produce a net lifecycle GHG savings estimate for biofuel use. This measure is typically used for evaluating policies which specifically relate to biofuels and the RTFO.

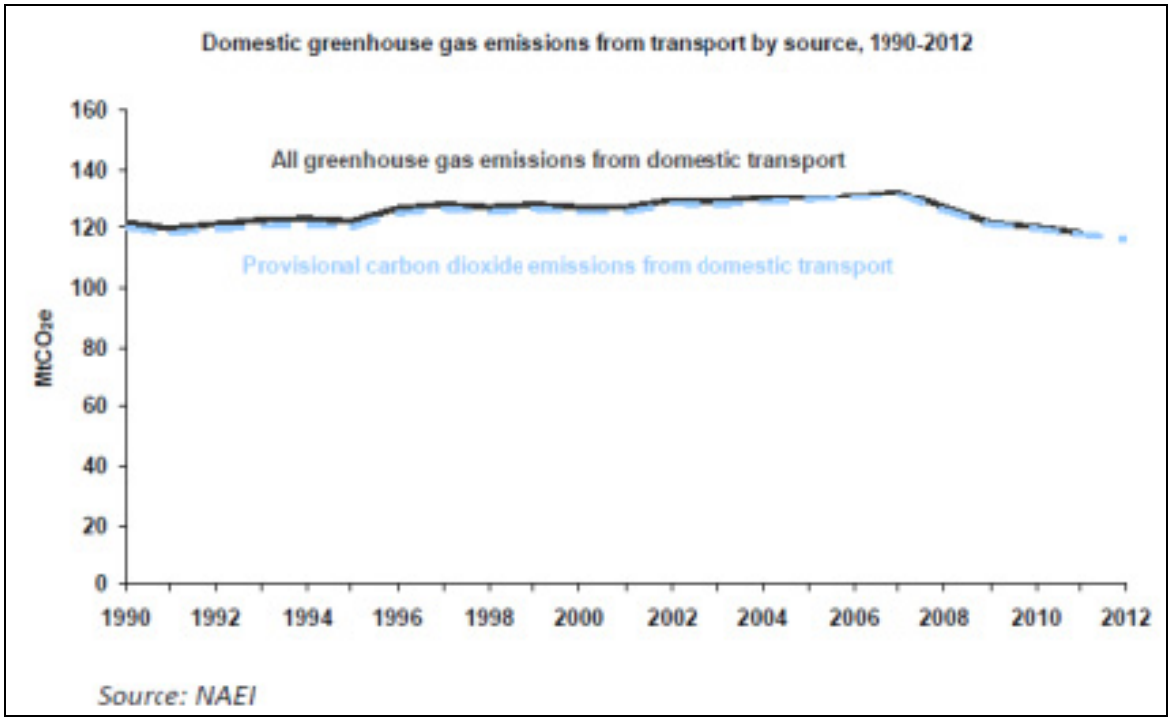
'IPCC reporting' GHG savings metric assumes that the use of biofuels leads to a 100% saving of combustion emissions in the transport sector. All other aspects of the lifecycle GHG savings metric are attributed to other sectors (i.e. agriculture, refining, overseas) under this system of accounting. This measure is used to inform overarching carbon policy analysis (e.g. carbon budgets, National Atmospheric Emissions Inventory) and is in line with Intergovernmental Panel on Climate Change (IPCC) guidance.

Carbon reduction targets

3.5 In 2008, emissions in the transport sector accounted for around a quarter of UK greenhouse gas emissions (132 million tonnes of CO_2 equivalent ($MtCO_2e$)) and the majority (around 90%) of those emissions came from road transport.[16] At the time of the original impact assessment in 2007 emissions from transport were rising and the 2007 Energy Review expected further increases to 2020.[17]

3.6 Since 2007, emissions from transport have decreased by12% as illustrated in the chart below. Improvements in car fuel economy and increased use of biofuels have contributed to this reduction.[18]

Figure 3.1: Domestic GHG emissions from transport by source, 1990-2012 (IPCC reporting basis)



3.7 Despite recent falls in transport emissions, ensuring ongoing reductions remains challenging. Notwithstanding a long term trend of emissions reductions over the last decade across the economy, provisional data for 2012 indicates a 3% increase in the UK's overall emissions compared to 2011. The UK has legally binding climate change targets both for the long term to reduce emissions by at least 80% below 1990 levels by 2050; and, in the shorter term to reduce emissions by 34% below 1990 levels by 2020.[19]

[16] Committee on Climate Change, 2010)
[17] The 2007 Energy Review anticipated an increase in overall emissions from transport from 119 million tonnes of CO_2 to 124 million tonnes in 2020.
[18] Emissions reductions are calculated using the IPCC carbon reporting measures for biofuels
[19] Climate Change Act, 2008

Original RIA expectations

3.8 The 2007 impact assessment estimated that the RTFO would save 3.2 $MtCO_2e$ (on a lifecycle basis) per annum in 2010 when the obligation was (at that time) due to reach 5%, rising to 4.3 $MtCO_2e$ per annum in 2020. This assumed that biofuels lifecycle CO_2 savings were around 50% and grow to 75% over time.

3.9 The review also estimated tailpipe savings for the purposes of the UK's national greenhouse gas emissions inventory. These estimated 5.3 $MtCO_2e$ in 2010 (on an IPCC reporting basis) reducing to 5.1 $MtCO_2e$ in 2020[20].

2011 Amendments

3.10 In 2011 the RTFO was amended to include minimum levels of lifecycle greenhouse gas saving for biofuels. These were set to increase over time as illustrated in Table 3.1 below and were linked to the point in time when biofuel production facilities commenced operation.

Table 3.1

Period	Date production started at an installation		
	Pre 24/01/08	Post 24/01/08	Post 01/01/17
15/12/2011 to 31/03/2013	No minimum	35%	-
01/04/2013 to 31/12/2016	35%	35%	-
01/01/2017 to 31/12/2017	50%	50%	50%
01/01/2018 to 31/12/2020	50%	50%	60%

3.11 The regulatory impact assessment noted that in the period to January 2011, 71% of biodiesel and 87% of bioethanol supplied under the RTFO would have met the 35% lifecycle GHG savings minimum threshold. The assessment expected the effect of the amendments would raise the minimum and average GHG savings delivered by biofuels supplied in the UK. Any additional savings estimates were not quantified.

[20] Rising projected lifecycle GHG savings reflect an assumed improvement in average RTFO lifecycle GHG savings over the period 2010 to 2020. Falling tailpipe emissions reflect an assumed drop in overall fuel supplied (and therefore biofuel supplied under the RTFO) over this period.

Greenhouse gas lifecycle methodologies for biofuels

RED methodology

3.12 There are a variety of lifecycle analysis methodologies that can be used to estimate the greenhouse gas effects of substituting petrol and diesel with biofuels. The RED specifies a particular methodology, which is used for the RTFO. It provides 'default' values for biofuels made from various feedstocks and allows suppliers to use actual data, for example for processing emissions, to provide more accurate estimates.

Indirect land use change accounting

3.13 Around the same time the RTFO was being implemented in 2008, scientists were questioning whether the lifecycle methodologies used for biofuels appropriately reflected their effect on GHG emissions. The UK Gallagher Review concluded that crop derived biofuels could 'indirectly' cause expansion of agricultural production onto carbon rich land. This indirect land use change (ILUC) effect was not captured in the lifecycle analysis. Concerns about ILUC have led to a review of the RED which is currently being negotiated.

3.14 This review provides estimates of lifecycle GHG savings both with and without the estimated ILUC impacts.

Review results

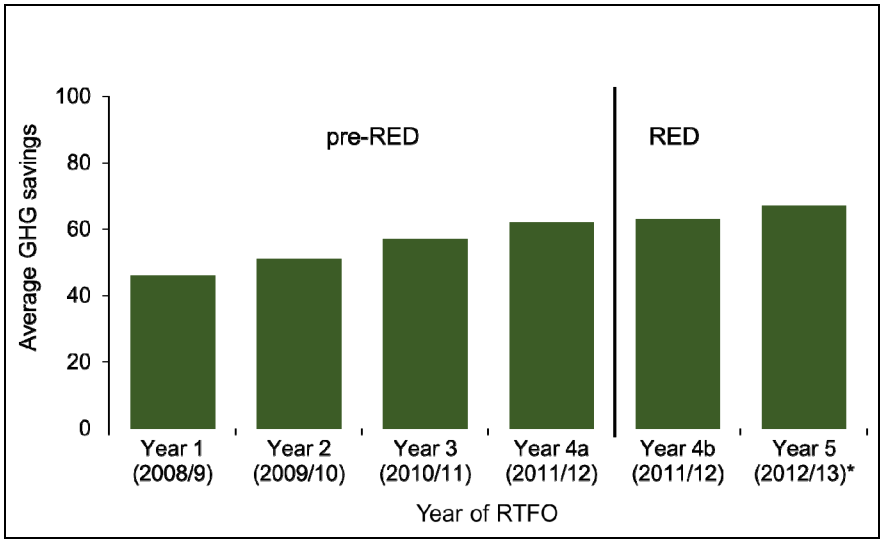
3.15 Table 3.2 shows the estimated total lifecycle GHG savings (without GHG emissions from indirect land use change (ILUC) taken into account) in each year of the RTFO. These are lower than estimated in the original RIA, which anticipated 3.2 $MtCO_2e$ per annum in 2010. However, the primary reason for the lower savings was the reduced biofuel supply which resulted from re-profiling the RTFO targets to increase at a slower rate in response to concerns about ILUC. As illustrated in the previous chapter, in 2010/11 actual biofuel supply was 3.27% (against a 3.5% obligation) rather than the 5% in the original legislation. When adjusted for the difference in obligation levels, GHG savings reported in were 2010/11 almost exactly in line with what was estimated in the original impact assessment.

Table 3.2: RTFO GHG savings (not including ILUC)					
Total biofuel GHG savings – direct	**$mtCO_2$/year**				
Fuel Type	**Year 1 2008/09**	**Year 2 2009/10**	**Year 3 2010/11**	**Year 4 2011/12**	**Year 5* 2012/13**
Biodiesel	1.261	1.433	1.479	1.948	1.106
Bioethanol	0.287	0.519	0.594	0.490	0.823
Biogas	0.001	0.001	0.001	0.002	0.003
Biomethanol	0.000	0.000	0.000	0.002	0.037
MTBE	0.000	0.000	0.000	0.000	0.038
Pure Vegetable Oil	0.000	0.000	0.000	0.000	0.000
Total (net) GHG savings	**1.55**	**1.95**	**2.07**	**2.44**	**2.01**

*Data for Year 5 is incomplete.

3.16 Figure 3.2 illustrates the aggregate average GHG savings (not including ILUC) of biofuels supplied under the RTFO over time. It shows the average savings growing from 46% in Year 1 to 67% for the provisional data in Year 5. By this measure, the GHG savings performance is well on track to achieve the original RIA estimation of 50% growing to 75% by 2020.[21]

Figure 3.2: RTFO Average GHG savings (not including ILUC) over time



[21] Note that GHG savings are weighted by volume rather than energy.

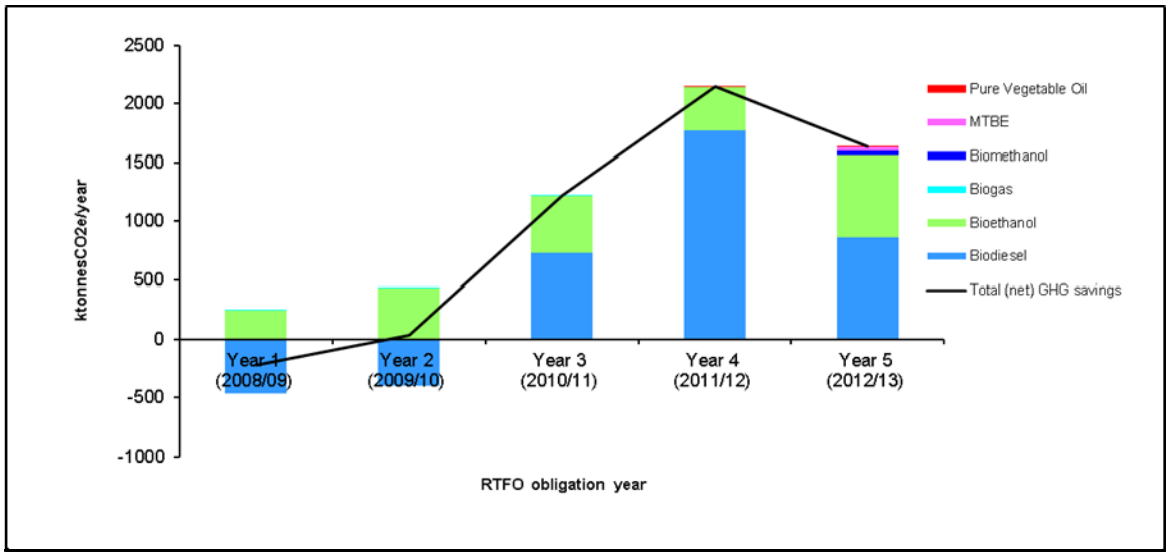
3.17 Table 3.3 shows the estimated total lifecycle GHG savings (with GHG emissions from indirect land use change (ILUC) taken into account) in each year of the RTFO. The overall effect is significant, particularly in the first year when the figures indicate a net increase in emissions. This is due to the predominance of crop based biodiesel providing the majority of supply under the RTFO at that time. It is thought that the ILUC effects of crop based biodiesel are much more significant that for bioethanol.

Table 3.3 RTFO GHG savings (including ILUC)

Total biofuel GHG savings including ILUC	**mtCO2/year**				
Fuel type	**Year 1 2008/09**	**Year 2 2009/10**	**Year 3 2010/11**	**Year 4 2011/12**	**Year 5* 2012/13**
Biodiesel	-0.464	-0.400	0.728	1.767	0.864
Bioethanol	0.244	0.437	0.492	0.374	0.691
Biogas	0.001	0.001	0.001	0.002	0.003
Biomethanol	0.000	0.000	0.000	0.002	0.037
MTBE	0.000	0.000	0.000	0.000	0.038
Pure vegetable oil	0.000	0.000	0.000	0.000	0.000
Total (net) GHG savings	**-0.22**	**0.04**	**1.22**	**2.15**	**1.63**

3.18 Figure 3.3 illustrates the GHG savings contribution by fuel type, including the effects of ILUC. In Years 1 and 2 of the RTFO biodiesel is the predominant fuel, and as it is mainly crop based the overall lifecycle emissions are estimated to be negative in Year 1 and to deliver a small saving in Year 2. From Year 3 of the RTFO, bioethanol supply becomes more significant and the feedstock for biodiesel becomes predominantly used cooking oil in response to fuel duty incentives (April 2010 to April 2012) and double counting (December 2011 onwards). The overall ILUC effect is therefore reduced significantly and the RTFO begins to deliver substantial carbon savings.

Figure 3.3: Total biofuel GHG savings (including ILUC)



3.19 The average lifecycle GHG savings (including ILUC) of fuels delivered under the RTFO are shown numerically in Table 3.4. The estimated average lifecycle GHG savings in Year 5 are 67% without ILUC (see Figure 3.2) and 56% with ILUC effects included.

Table 3.4: Average RTFO GHG Savings (including ILUC)

Year 1	Year 2	Year 3	Year 4	Year 5
-6%	1%	33%	56%	56%

IPCC reporting GHG savings

3.20 Analysis of IPCC reporting GHG savings from biofuels used for the national inventory shows 3.7 $MtCO_2e$ per year in 2010. This is lower than the original RIA estimate of 5.3 $MtCO_2e$, and is attributable to the lower supply following the re-profiling of the RTFO targets.

3.21 The original review anticipated a reduction in savings over time to 5.1 $MtCO_2e$ in 2020 due to reduced sales of fossil fuels (and consequently fewer biofuels required by the obligation). In Year 5 the current analysis indicates that the RTFO delivered savings of 2.9 $MtCO_2e$. This reflects the decreased supply under the RTFO following the introduction of the 2011 amendments and in particular double counting of waste derived fuels which means that fewer overall fuels are required to meet the obligation (see chapter 6 for further analysis of double counting).

Conclusions

3.22 Discounting the effects of ILUC, the RTFO's performance on average GHG savings has been broadly in line with the original impact assessment. Overall savings have been lower (2.07 $MtCO_2e$ compared to 3.2 $MtCO_2e$ in 2010), but this can be attributed almost entirely to the reduction in RTFO targets implemented in 2009 in response to concerns

about ILUC. Average GHG savings have been close to what was anticipated: measured savings of 48% in 2010 compared to 50% forecast and 67% in 2013, well on track to the 75% by 2020 forecast in the original assessment.

3.23 When ILUC is taken into account, the GHG savings of the RTFO are lower, but the most significant variations between direct and indirect performance are in the first two years of the RTFO before measures to incentivise waste-derived biofuels began.

3.24 The amendments introduced in 2011 to award double certificates (see chapter 6 for more detail) for biofuels derived from waste, combined with an increase in bioethanol supply which has lower ILUC effects, improved the RTFO's overall GHG performance. Taking ILUC into account, the RTFO delivered lifecycle GHG savings of 1.63 $MtCO_2e$ in Year 5 and average carbon savings of 56%.

Questions

Q 3.1 Do you have comments on the methodology used to assess ILUC effects (see Annex A)?

Q 3.2 Do you have evidence indicating whether the GHG performance of biofuels delivered under the RTFO will improve or worsen in the period to 2020 (including the effects of ILUC)?

4. Costs and cost effectiveness

Introduction

4.1 A key tenet of the Government's policy for bioenergy is that it should make a cost effective contribution to UK carbon emission objectives.

4.2 The RTFO was introduced to ensure supply at a level the Government wished to support whilst at the same time minimising the additional cost to the consumer (as the RTFO is a market driven mechanism, fuel suppliers are incentivised to minimise the cost of compliance).

4.3 This section considers the additional costs of supplying biofuel under the RTFO over the period. Carbon cost effectiveness is measured in terms of £/tCO_2 and is a critical measure to assess how the RTFO is performing. These are compared with the expectations in the original RIA and also put into context with other carbon reduction policies. As with the GHG analysis, results are modelled both with and without estimates for the effect of ILUC. A £/MWh cost effectiveness metric can also be used to evaluate Renewable Energy Directive compliance costs.

4.4 The vast majority of additional costs relate to supplying the fuel, but the costs of administration and enforcement are also addressed.

4.5 The costs of the 2011 amendment of the RTFO to implement the RED are also considered.

Original RIA expectations

Additional fuel costs

4.6 The 2007 impact assessment noted that if 5% of biofuel penetration was achieved with the incentive at the (then) current rate of 20ppl, it would cost around £500 million per year (nominal price base) in foregone fuel duty revenue.

4.7 The assessment estimated that the average annual cost (over the period to FY20/21) of the RTFO would be £200m to £563m (2007 price base) depending on the costs of fossil fuel.

4.8 The additional cost of the fuel was expected to be passed onto consumers through an increase in fuel prices. In order to limit the impact on the consumer, a buy-out mechanism was included to cap the potential increase. For 2010 the buy-out was set at 0.30p per litre. At 5% sales and 0p duty incentive, the extra price increase was capped at 1.76ppl (1.5ppl +VAT) (nominal price base).

4.9 The assessment noted that key assumptions had to be made regarding the costs of renewable fuels and fossil fuels, and these could vary significantly. Resource costs of biofuels were estimated at 0.38p and 0.52p per litre for bioethanol and biodiesel respectively for 2010, reducing to 0.31p and 0.37p respectively (2007 price base).

4.10 Central, low and high oil price forecasts were used to estimate conventional fuel prices. The central oil price anticipated costs at $53-57 per barrel, rising to $70-80 per barrel for the high oil price scenario.

4.11 The additional costs were estimated to be 0.04-0.10p per litre for bioethanol and 0.15 to 0.20p per litre for biodiesel for 2010.

Administration and retail (2007 price base)

4.12 The impact assessment estimated that the annual cost of enforcement of the RTFO by the Administrator to be £1.5m.

4.13 Annual administration costs for larger obligated suppliers was estimated at £75k.

4.14 Fuel retailers were estimated to face additional costs to prepare and maintain their facilities for biofuels to cover activities including tank cleaning, clearing out microbiological infestations and protecting pumps against acids derived from biofuels. These were estimated at a cost of £5 million, spread across approximately 10,000 filling stations and commercial sites.

Cost effectiveness (2007 price base)

4.15 The original impact assessment estimated that the RTFO would, on average, cost £87/tCO_2 (lifecycle basis) saved, with a range of £56 to £123/tCO_2.

4.16 These costs were calculated by dividing the sum of the discounted[22] stream of costs (over the period to 2020) attributed to the RTFO by the sum of the (undiscounted) stream of carbon savings attributed to the RTFO.

2011 Impact Assessment

4.17 Suppliers were assumed to require an additional three verifications a year relative to the baseline following the requirement to have carbon and sustainability information of biofuel supply independently verified. Each assurance statement was expected to cost around £15,000 for large suppliers and £1500 for smaller suppliers.

4.18 Government administrative costs were also anticipated to increase at around £28,000 per year.

4.19 The effect of the 2011 amendments to introduce sustainability requirements and double certification of waste derived fuels are considered in chapters 5 and 6.

[22] 3.5% discount rate

Review results

Resource costs

4.20 Figure 4.1 and Table 4.1show the estimated resource costs of biofuel under the RTFO over obligation Years 1 to 5. The resource costs are calculated as the additional cost of supplying biofuel relative to displaced fossil fuel.

4.21 The chart shows nominal costs, whilst the table also shows costs in 07/08 prices (with inflation stripped out) for ease of comparison with the original impact assessment.

4.22 Costs are within the range (£200m to £563m – 2007 prices) presented in the original RTFO impact assessment. Costs were highest in Years 3 and 4 when an additional 0.20p per litre fuel duty differential was in place for UCO-derived biodiesel, and have decreased substantially in Year 5.

Figure 4.1: Resource costs of biofuel supplied under the RTFO (nominal prices)

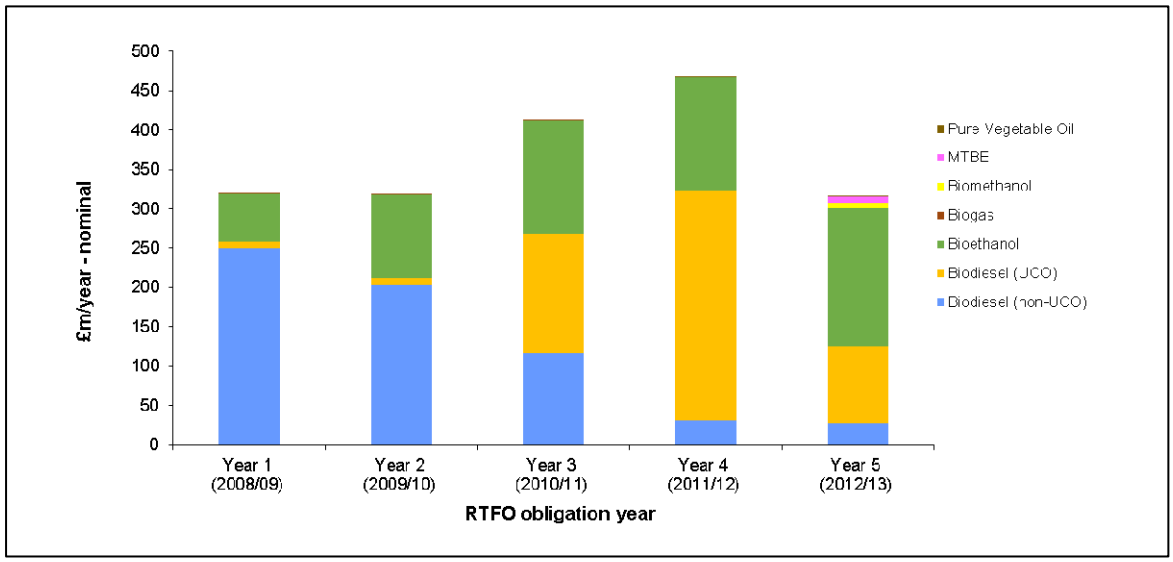


Table 4.1: Resource cost – nominal vs 07/08 prices

	Year 1 2008/09	Year 2 2009/10	Year 3 2010/11	Year 4 2011/12	Year 5 2012/13
Resource cost £m/year (nominal)	319	318	412	468	315
Resource cost £m/year (07/08 prices)	310	301	380	422	279

4.23 Actual fuel prices have been higher than in the original assessment, but the cost differential between biofuels and fossil fuels is the critical factor in determining the additional costs of the RTFO. The original IA anticipated additional costs of 0.4-0.10p per litre for bioethanol and 0.15

to 0.20p per litre for biodiesel for 2010. Observed additional costs (based on wholesale market price data) have been within the ranges identified in the impact assessment for both bioethanol and biodiesel, though at the upper end.

Fuel price impacts

4.24 Table 4.2 illustrates the additional costs of biofuel supply over the period in terms of pence per litre. As with other biofuel resource costs calculated for this review, these have been adjusted to account for the lower energy content contained in biofuels to show the true petrol equivalent on a per litre basis. For Years 1-4 of the RTFO these additional costs would not have been felt directly at the fuel pump by consumers because the 20ppl fuel duty incentive was in place[23] – for all biofuels until the end of Year 2 and then for UCO biodiesel for Years 3 and 4 (i.e. the majority of additional cost was paid out of general taxation). The figure for Year 5 (0.81p including VAT) reflects the actual additional cost experienced by motorists following the removal of the duty incentive for all biofuels. This cost is equivalent to 0.6% of the average retail price of fuel. For an average car, this is equivalent to roughly an £8 (including VAT) increase in the annual fuel bill.[24] By way of comparison, renewable energy incentives are estimated to add 3% to the average household energy (gas + electricity) bill in 2013[25].

Table 4.2 Fuel price impacts (nominal prices)

Additional resource	Year 1 2008/09	Year 2 2009/10	Year 3 2010/11	Year 4 2011/12	Year 5* 2012/13
Pence cost per MJ	0.02	0.02	0.03	0.03	0.02
Pence/litre petrol equivalent (pre-VAT)	0.64	0.65	0.86	0.99	0.67
Pence/litre petrol equivalent (post VAT)	0.76	0.75	1.01	1.19	0.81

[23] The 20ppl duty differential provided an additional 0.20p per litre financial incentive for the supply of biofuel up until April 2010. From April 2010 to April 2012 the duty differential applied only to biodiesel made from used cooking oil.
[24] This assumes an average family car covering average mileage of 9000 miles a year.
[25] https://www.gov.uk/government/publications/estimated-impacts-of-energy-and-climate-change-policies-on-energy-prices-and-bills

Pump price impacts

As biofuels are typically more expensive than fossil fuels, the RTFO has the effect of increasing the price of fuels at the pump.

Average pump price impacts have been estimated by taking the estimated additional cost of supplying biofuels under the RTFO and dividing this figure by the total volume of fuel supplied. As biofuels and fossil fuels have varying energy density the average price impact has been calculated in energy terms and expressed by unit energy and also per litre of petrol equivalent (i.e. for 32.95 MJ of fuel).

4.25 The original IA noted that the buy-out mechanism capped the additional cost that consumers might pay at £1.76p per litre (including VAT) if suppliers chose to 'buy-out' of their obligation when it reached 5%. The current theoretical maximum impact on pump prices is slightly lower at £1.70p due to the lower obligation level (4.75%).

Cost effectiveness

4.26 A key measure of the effectiveness of the obligation is the cost of carbon saved. Table 4.3 below illustrates the costs to Year 5, excluding the effects of ILUC. These have been calculated by dividing the cost of the RTFO by carbon savings for each year. Cost effectiveness by this measure has moved up and down over the period as the costs and fuel mixes have changed. Making comparisons with the £/tCO_2 numbers presented in the original IA is complicated as these were presented as a discounted flow of GHG savings over the period 2008 to 2020. However, as average GHG savings have been broadly in line with what was projected, whilst the additional costs of biofuel have been towards the top end of the range projected, we can say that £/tCO_2 costs (excluding ILUC) have also been towards the top end of the range initially projected.

Table 4.3 Cost/tonne of carbon (excluding ILUC)

Additional resource	Year 1 2008/09	Year 2 2009/10	Year 3 2010/11	Year 4 2011/12	Year 5* 2012/13
Resource cost £/tCO_2 (nominal prices)	206	163	199	192	157
Resource cost £/tCO_2 (07/08 prices)	200	154	183	173	139

4.27 Table 4.4 includes the estimated emissions from Indirect Land Use Change (ILUC). In Year 1 with ILUC included there were net emissions, and in Year 2 costs were very high due primarily to higher levels of crop based biodiesel supplied during this period, which is understood to have significant indirect effects. Carbon cost effectiveness improves significantly from Year 3. This improvement can be attributed partly to the

fuel duty differential for UCO-derived biodiesel (Years 3 and 4) and double certification of waste-derived biofuels (see chapter 6 for further analysis) which increased the supply of low ILUC risk waste-derived biofuels (from December 2012 onwards), and partly to the increased relative share of bioethanol which is understood to have lower ILUC effects.

Table 4.4 Cost/tonne of carbon (including ILUC)

Additional resource	Year 1 2008/09	Year 2 2009/10	Year 3 2010/11	Year 4 2011/12	Year 5* 2012/13
Resource cost £/tCO_2 (nominal prices)	N/A	8531	337	218	193
Resource cost £/tCO_2 (07/08 prices)	N/A	8076	311	197	171

4.28 Looking across other sectors of the economy biofuels appear to be a relatively expensive carbon abatement measure. Abatement costs attributed to the RTFO over the period 08/09 to12/13 have been consistently higher than DECC carbon values for the non-traded sector[26]which range from £47 to £57/tCO_2 (2007 prices – central scenario) over the period 2008 to 2020. However Biofuels are more in line with other CO_2 abatement options in transport, which tend to be more expensive than other sectors. Due to its size significant reductions in CO_2 emissions in transport will be required if the government is going to meet its CO_2 reduction targets. This means pursuing policies which, in the short-run at least, are less cost-effective than in other sectors.

4.29 Table 4.5 below presents cost per megawatt hour. RTFO £/MWh costs have ranged from £25 to £38/MWh (nominal prices) over the period 08/09 to 12/13. By way of comparison, electricity and heat sector renewable energy subsidies ranged from £52 to £56/MWh (nominal prices) over the period 08/09 to 11/12.[27] This suggests that biofuels are currently a relatively low cost means of complying with EU renewable energy targets.

[26] Non traded sector carbon values are used as a benchmark to evaluate cost effectiveness of carbon abatement measures which fall outside the EU Emission Trading Scheme, such as fuel efficiency measures for cars, boiler efficiency and the RTFO. Measures which have an abatement cost below the non-traded carbon value are considered cost effective relative to alternative abatement options across the economy.

[27] Based upon figures taken from DECC annual report https://www.gov.uk/government/publications/annual-report-and-accounts-2012-13 (page 32)

Table 4.5 Cost/megawatt hour					
Additional resource	**Year 1 2008/09**	**Year 2 2009/10**	**Year 3 2010/11**	**Year 4 2011/12**	**Year 5* 2012/13**
Resource cost £/MWh (nominal)	29	25	35	38	33
Resource cost £/MWh (07/08)	28	23	32	34	29

Administration and retail

4.30 The annual cost of enforcement of the RTFO by the Administrator has been lower than anticipated. In Year 4 administration passed to the Department for Transport from the Renewable Fuels Agency. Whilst costs were anticipated to increase following the 2011 amendments, Year 5 costs have reduced.

Table 4.6 Cost of administration (nominal prices)					
	Year 1 2008/09	**Year 2 2009/10**	**Year 3 2010/11**	**Year 4 2011/12**	**Year 5 2012/13**
Net expenditure £000's	1,321	1,364	1,486	1,048	584

4.31 Annual administration costs for larger obligated suppliers were estimated at £75k. The Renewable Fuels Agency's report to Parliament on the RTFO found administrative costs to be broadly in line with the impact assessment. The administrative costs following the 2011 amendments will be assessed as part of this review.

4.32 Views are sought on the additional costs to fuel retailers to cover activities including tank cleaning, clearing out microbiological infestations and protecting pumps against acids derived from biofuels.

Verification costs

4.33 Estimates on verification costs have yet to be tested. Industry stakeholders are invited to submit evidence related to these costs in response to publication of this draft Post Implementation Review.

Conclusions

4.34 The estimated costs of the RTFO over the period 08/09 to 12/13 have been within the bounds of original estimates in the 2007 impact assessment, although outturn biofuel and fossil fuel prices have been considerably higher than was envisaged under central assumptions in 2007.

4.35 Recent performance of the RTFO suggests that biofuels offer relatively expensive carbon savings when compared to alternative abatement opportunities within the economy, but relatively low Renewable Energy Directive compliance costs when compared to comparable cost data from the heat and power sectors.

4.36 The primary impact of the RED amendments on cost effectiveness has been to encourage waste derived biodiesel over crop biodiesel. These changes have been effective in reducing £/tCO_2 carbon abatement costs but have placed upwards pressure on £/MWh Renewable Energy Directive compliance costs.

4.37 The stakeholder survey conducted alongside this draft review will seek to further assess the costs of the 2011 amendments.

Questions

Q 4.1 Do you agree with the costs presented in this chapter?

Q 4.2 Are the verification costs quoted in paragraph 4.26 an accurate reflection of costs faced by fuel suppliers obligated under the RTFO? If not, please provide costs faced by your organisation.

Q 4.3 Do you anticipate the cost will increase, decrease or remain steady over time?

Q 4.4 Are there ways to reduce the cost of verification while maintaining effective compliance?

5. Minimum sustainability criteria

Introduction

5.1 The RTFO included the world's first operational sustainability reporting scheme for biofuels implemented by a national government. Whilst the original legislation did not require that biofuels met any sustainability criteria, mandatory reporting of carbon and sustainability data was a key element. To encourage supply of sustainable biofuels, for the first three years, increasing voluntary targets were set for GHG savings and meeting environmental standards. The performance of the RTFO and of individual fuel suppliers was measured against these targets.

5.2 The transport elements of the Renewable Energy Directive (RED) were implemented in the UK on 15 December 2011. The RED is closely linked to the Fuel Quality Directive (FQD) and both directives include mandatory carbon and sustainability requirements that must be met if biofuel is to count towards European targets. These sustainability criteria require that:

- Biofuels must achieve at least a 35% GHG emissions saving (this threshold rises over time to 50 or 60% depending on the age of the biofuel production plant)[28];
- Biofuels may not be made from raw material obtained from land with high biodiversity value in or after January 2008;
- Biofuels may not be made from raw material obtained from land with high carbon stock such as forests or land that was undrained peatland in January 2008 unless strict criteria are met.

Voluntary schemes

5.3 Voluntary schemes are typically agri-assurance standards which require verification against a number of mandatory sustainability-related principles and criteria. The European Commission[29] has recognised a number of voluntary schemes as suitable for demonstrating compliance with the mandatory sustainability criteria of the RED. They are a key mechanism for fuel suppliers and other economic operators along the supply chain to use to demonstrate compliance.

[28] Under the 'grandfathering clause' biofuels produced in installations that were already operational on 23 January 2008 did not have to meet the 35% threshold until 1 April 2013.
[29] http://ec.europa.eu/energy/renewables/transparency_platform/transparency_platform_en.htm

5.4 Some voluntary schemes were set up specifically to meet the requirements of the RED, whilst others were already in existence[30] and have made amendments in order to align with the RED sustainability criteria. Many voluntary schemes go beyond the requirements of the RED and include other environmental as well as social criteria.

5.5 The majority of voluntary schemes recognised by the Commission cover the chain of custody and therefore provide assurance from the farm (or origin of waste material which can be turned into biofuel) to supply into the UK road transport market. Table 5.1 below sets out the scope of the voluntary schemes recognised by the Commission.

The RTFO Biofuel Sustainability Meta-Standard

5.6 Whilst the RTFO does not require that fuel suppliers use voluntary schemes the use of these was encouraged from its outset. The RTFO Biofuel Sustainability Meta-Standard, which covers key environmental and social principles and criteria,[31] was used prior to RED implementation to set the benchmark[32] for biofuel sustainability. It was developed in consultation with stakeholders and was designed such that existing feedstock sustainability standards could be used to demonstrate compliance where they covered sufficient criteria.

Original RIA expectations

5.7 The original impact assessment did not set any targets or make predictions with respect to the amount of sustainable biofuel likely to be supplied under the RTFO, aside from those around carbon savings that are addressed in chapter 3. It did, however, take into account sustainability concerns in the analysis of which policy options to pursue and noted that collection of carbon and sustainability data would enable monitoring of the sustainability impact of the biofuels supplied.

5.8 The impact assessment also noted the concerns raised by stakeholders on impacts of the RTFO on the environment including whether carbon savings would be achieved. The majority of the stakeholders who responded to the consultation were members of the public who asked that mandatory minimum standards for carbon saving and sustainability be introduced from the outset.

5.9 The impact assessment made clear that the collection of carbon and sustainability data was the first step in encouraging sourcing of sustainable biofuels and that the Government intended to move towards a system that only rewarded sustainable biofuels (covering feedstock production and carbon savings) over time.

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[30] Sustainability standards or voluntary schemes have arisen in response to concerns related to impacts on the environment from product production and/or social conditions of workers in the supply chain. They go beyond the scope of biofuels and cover a multitude of products and sectors e.g. FSC to denote sustainable wood products.

[31] These principles and criteria can be found in Annex B of the RTFO Guidance: https://www.gov.uk/government/publications/rtfo-guidance

[32] http://webarchive.nationalarchives.gov.uk/20100202100434/renewablefuelsagency.gov.uk/reportsandpublications/guidance/carbonandsustainabilityguidance/benchmarks.cfm

Table 5.1.Voluntary schemes used to demonstrate biofuel sustainability and their scope

Voluntary scheme name[33]	Scheme scope			RED sustainability compliance				
	Geographical	Feedstock	Chain of custody	GHG	Bio-diversity	Carbon stocks	COC[34]	Audit quality
2BSvs	Global	Multi-feedstock	Whole supply chain	Default only	Yes	Yes	Yes	Yes
BioGrace	Global	Multi-feedstock	Whole supply chain	Actual	No	No	No	No
Bonsucro EU	Global	Sugar cane	Whole supply chain	Default only	Yes	Yes	Yes	Yes
Ensus VS	EU	Wheat	1st gathering point to ethanol storage	Actual or default	Yes	Yes	Yes	Yes
Greenergy VS	Brazil	Sugar cane	Whole supply chain	Default only	Yes	Yes	Yes	Yes
ISCC	Global	Multi-feedstock	Whole supply chain	Actual or default	Yes	Yes	Yes	Yes
NTA 8080	Global	Multi-feedstock	Whole supply chain	Actual or default	Yes	Yes	Yes	Yes
RBSA	Global	Multi-feedstock	Whole supply chain	Actual or default	Yes	Yes	Yes	Yes

[33] Voluntary schemes are: Abengoa RED Bioenergy Sustainability Assurance (RBSA), BioGrace GHG calculation tool, Biomass Biofuels voluntary scheme (2BSvs) , Ensus Voluntary Scheme underRED for Ensus Bioethanol Production (Ensus VS), Greenergy Brazilian Bioethanol verification programme (Greenergy VS), International Sustainability and Carbon Certification (ISCC), NTA 8080 Certification Scheme (NTA 8080), Red Tractor Farm Assurance Combinable Crops & Sugar Beet Scheme (Red Tractor), Roundtable on Sustainable Biofuels EU RED (RSB EU RED), Roundtable on Sustainable Palm Oil RED (RSPO RED), Scottish Quality Farm AssuredCombinable Crops (SQC)

[34] COC = chain of custody

Voluntary scheme name[33]	Scheme scope			RED sustainability compliance				
	Geographical	Feedstock	Chain of custody	GHG	Bio-diversity	Carbon stocks	COC[34]	Audit quality
Red Tractor	UK	Cereals, oil seeds, sugarbeet	Farm to first gathering point	No	Yes	Yes	Yes	Yes
REDcert	Mainly EU	Multi-feedstock	Whole supply chain	Actual or default	Yes	Yes	Yes	Yes
RSB EU RED	Global	Multi-feedstock	Whole supply chain	Actual or default	Yes	Yes	Yes	Yes
RSPO RED	Global	Palm	Whole supply chain	Default only	Yes	Yes	Yes	Yes
RTRS EU RED	Global	Soy	Whole supply chain	Actual or default	Yes	Yes	Yes	Yes
SQC	Scotland,N England	Winter wheat, maize, oil seed rape	Farm to first gathering point	No	Yes	Yes	Yes	Yes

2011 Impact Assessment

5.10 Implementation of the minimum sustainability criteria was expected to deliver benefits through:

- Improved lifecycle GHG savings from the biofuels supplied under the RTFO;
- Improved biodiversity outcomes;
- Reduced depletion of high carbon stock land; and
- Increased sustainable development.

5.11 However, it was noted that the implications of these requirements are particularly uncertain and difficult to evaluate.

5.12 Given that there is significant global agricultural production occurring in areas which do not have high carbon stocks or biodiversity, it was anticipated that suppliers would be able to obtain increased volumes of compliant biofuel following the introduction of the sustainability criteria.

5.13 The impact assessment predicted that there might be some short term price pressures as biofuel producers gradually adapt to the requirements of the criteria. The projected impacts on the biodiesel and bioethanol prices are shown in Figures 5.1 and 5.2 below. Costs were projected to be passed to the consumer such that pump prices would increase by an estimated 0 to 0.4ppl (including VAT) over the period 2012 to 2020 in the central scenario. Observed market price data for biodiesel suggests that the price premium for RED compliant biodiesel to date has been broadly in line with the central scenario presented in the impact assessment. It has not been possible to obtain comparable data for bioethanol.

Figure 5.1:Projected impact of sustainability criteria on biodiesel prices (pence per litre, 2010 prices)

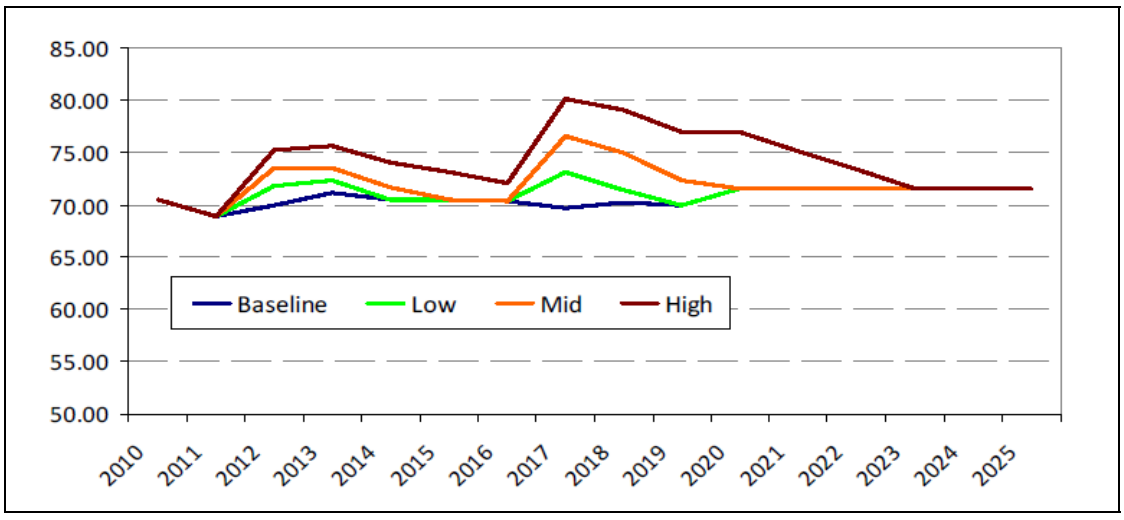
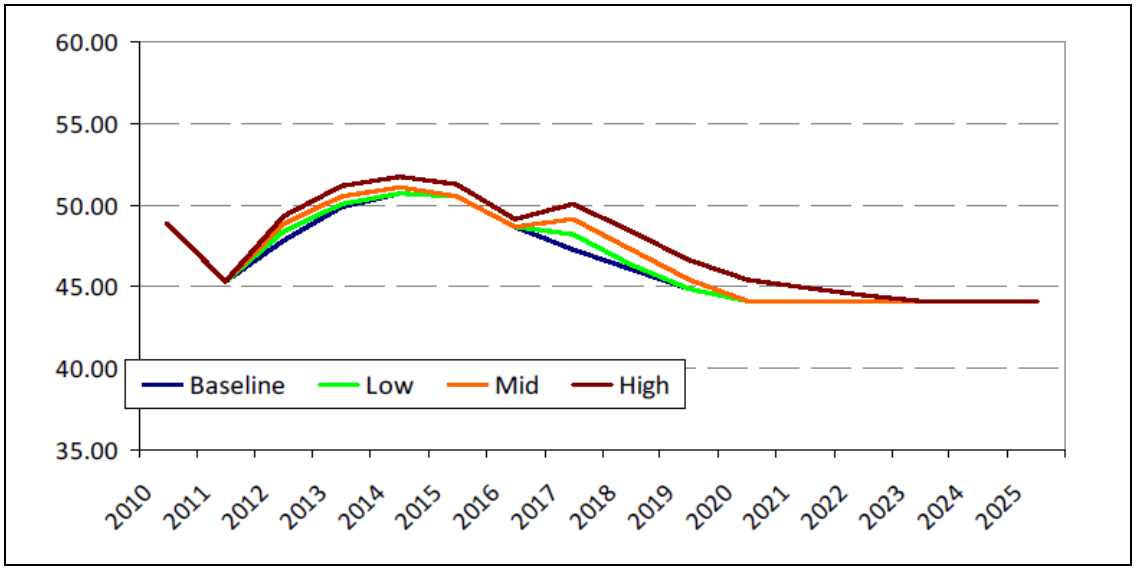


Figure 5.2: Projected impact of sustainability criteria on bioethanol prices (pence per litre, 2010 prices)



5.14 Other non-monetised benefits relevant to sustainability include potential small ancillary benefits arising from a possible reduction in driving including air pollution; and production of more sustainable biofuels.

RTFO performance

How much biofuel has been demonstrated to be sustainable?

5.15 Following the introduction of the RED in the UK, only sustainable biofuel is rewarded under the RTFO with any unsustainable biofuel not counting towards a supplier's obligation. It therefore has not made economic sense to supply unsustainable biofuel and this is largely reflected in the data:95% and 99% of the biofuel supplied in Years 4b and 5, respectively, have been demonstrated to be sustainable (see Table 5.2).

5.16 This data indicates that the market was largely prepared for the mandatory sustainability introduced by the 2011 amendments. Reporting against sustainability criteria for the preceding three and a half years is likely to have played a key part in enabling this transition.

5.17 For the biofuel that was not demonstrated to be sustainable, suppliers may have chosen to not apply for RTFCs, or their applications for RTFCs were unsuccessful. In Year 4b,a significant proportion of this biofuel can be accounted for as a consequence of an obligated supplier going into administration. This also impacted suppliers who had purchased from this supplier, as the sustainability data was not available and therefore RTFCs could not be applied for.

Table 5.2. Biofuel that has been demonstrated to be sustainable since RED implementation		
RTFO period	**Year 4b** **15 Dec 2011-14 Apr 2012**	**Year 5**[35] **15 Apr 2012-14 Apr 2013**
Proportion of biofuel to which RTFCs have been issued	95%	99%

Uptake of voluntary schemes

5.18 The uptake of voluntary schemes has increased almost four fold since the first year of the RTFO to become the main route of demonstrating compliance with the sustainability criteria (Figure 5.3 below). Initial uptake was limited by the availability of biofuel certified by a voluntary scheme, as many schemes were still under development and not yet operational.

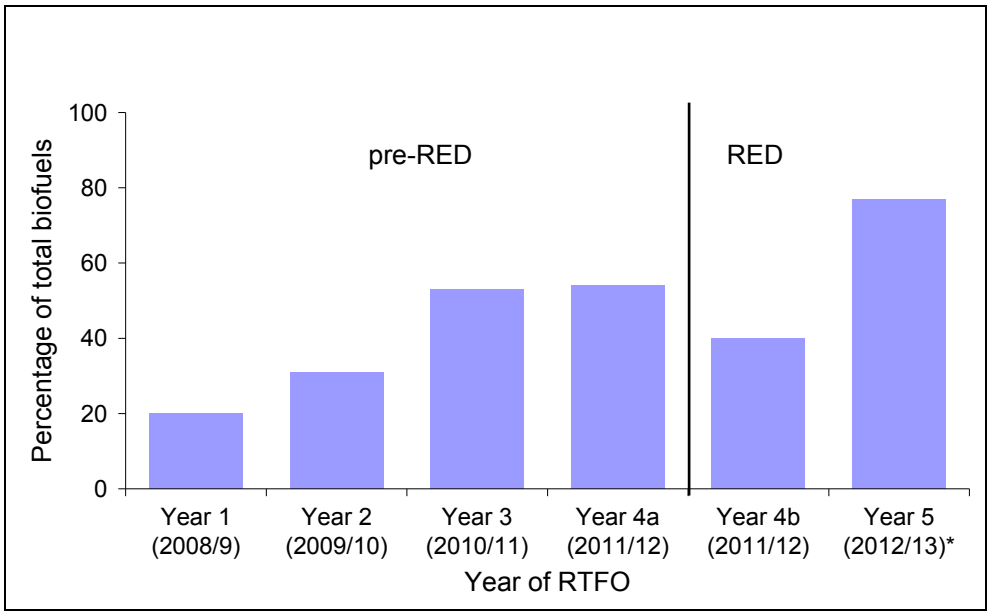
5.19 The introduction of the RTFO (including the RTFO Meta-Standard) and the RED were key to driving the market for these schemes. Many voluntary schemes amended their principles and criteria to meet the qualifying level of recognition under the RTFO against the RTFO Meta-Standard and later to be recognised by the European Commission, both of which helped to raise the sustainability bar.

5.20 Nonetheless, even where biofuel/biofuel material that was certified to be sustainable was available on the market, it was not always sourced for use in the UK. The uptake of voluntary schemes reflects a difference in approach by individual suppliers where some rose to the challenge of supplying demonstrably sustainable biofuel early on whilst others were slower to change behaviour.

5.21 The dip in uptake of voluntary schemes immediately following implementation of the RED (year 4b) may be attributable to limited availability of certified material. The European Commission did not recognise the first tranche of voluntary schemes until August 2011 and these new or revised versions of existing schemes then took some time to penetrate the market. There is likely to have been some competition between suppliers of road transport fuel suppliers to source these certified biofuels as a number of Member States had implemented the RED by this point, some of whom require that the biofuel must meet a voluntary scheme.

[35] Note that this is based on an incomplete dataset – the final dataset will be published in February 2014 and included in the final PIR.

Figure 5.3: Biofuel meeting a voluntary scheme over time



Note that biofuel meeting an environmental standard[36] has been used as a proxy for voluntary scheme for the pre-RED period.

5.22 The RTFO Administrator has encouraged uptake of voluntary schemes through its guidance, including the RTFO Meta-Standard, and more recently, through implementation of the sustainability compliance policy[37]. Voluntary schemes reduce the risk to suppliers over the provenance of biofuels by providing increased assurance over the sustainability data. They also have the potential advantage of reducing verification costs (see chapter 4) as the verifier does not need to check carbon and sustainability data all the way down the supply chain.

5.23 The market has responded to these factors and the substantial uptake of biofuel meeting voluntary schemes is one of the success stories of the RTFO – not least because voluntary schemes often go wider than the mandatory sustainability criteria covering other environmental and social criteria.

Indirect land use change

5.24 Whilst the RTFO (and the RED) ensure that only biofuel that is grown sustainably is rewarded and counts towards Member State's targets, the use of crop-based biofuels can lead to indirect land use change (ILUC). The potential impacts on GHG emissions are discussed in chapter 3. ILUC leads to loss of carbon stocks and/or biodiversity due to agricultural land expanding into forests, peatlands, wetlands, grasslands etc. This review has not sought to quantify these wider sustainability impacts. Negotiations are currently ongoing at the EU to find a policy solution which mitigates the impact of ILUC.

[36] This includes standards that met a minimum number of the RTFO Biofuel Sustainability Meta-Standard environmental criteria. See the RFA technical guidance for more details.
[37] See Annex A of the RTFO Process Guidance: https://www.gov.uk/government/publications/rtfo-guidance

5.25 Biofuels derived from wastes and residues are less likely to contribute to ILUC and are incentivised under the amended RTFO through receiving double RTFCs. The proportion of wastes and residues has increased substantially over time – see chapter 6.

Summary

5.26 The data indicates that the expectations of the original and 2011 impact assessments have been met including biofuel price impacts. The RTFO moved to mandatory sustainability as intended and almost all of the biofuel supplied since then has been proven to be sustainable (excluding ILUC). The majority of biofuels delivered under the RTFO now also meet voluntary schemes, many of which contain wider sustainability criteria than those in the RED. These are positive outcomes for the direct preservation of carbon stocks and biodiversity, though ILUC remains an issue for crop derived biofuels.

Questions

Q 5.1 Do you agree that the market was adequately prepared for the introduction of the mandatory sustainability criteria and that mandatory reporting of carbon and sustainability data in the preceding 3.5 years played a key role?

Q 5.2 Do you have data on the impact of the RED sustainability on biofuel prices? If so, do the observed impacts match the projected impacts shown in Figures 5.1 and 5.2?

Q 5.3 Are the reasons for the uptake of voluntary schemes correct i.e. reduced risk to the supplier and lower verification costs?

Q 5.4 Do you consider that there have been unintended consequences as a result of the RTFO amendments to include mandatory GHG and sustainability criteria?

Q 5.5 Within the boundaries of the EU RED legislative requirements, could the UK implementation of the GHG and sustainability criteria be improved? If so, how?

6. Double certification

Introduction

6.1 Double certification of waste-derived biofuels was introduced into the RTFO in December 2011.[38] This measure was required to transpose the requirements of the Renewable Energy Directive into UK law. As a result waste-derived biofuels now receive two certificates (which can be used to demonstrate compliance with the RTFO) in contrast to crop-derived biofuels which continue to receive one certificate.

Policy objectives

6.2 The policy objectives and intended effects set out in the impact assessment which accompanied this change were as follows:

6.3 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.

2011 Impact Assessment

RTFO biofuel supply

6.4 The impact assessment projected that the proportion of biofuels eligible for double certification would increase relative to crop derived biofuels, and that the volume of biofuels supplied to meet the RTFO would fall, reflecting the fact that lower volumes of (double certified) biofuels would be needed to demonstrate compliance with the obligation. It was also projected that double certification would stimulate the development of second generation 'advanced' biofuels which would begin to enter the market in 2015 under central assumptions.

[38] Waste-derived biofuels are defined as biofuel derived from wastes, residues, non-food cellulosic material and ligno-cellulosic material.

Costs

6.5 The impact assessment assumed that the price of biofuels eligible for double certificates would rise to reflect obligated suppliers' increased willingness to pay. Therefore there would be no net change in the cost of meeting the RTFO (as, relative to the baseline, suppliers would pay twice as much extra for half the volume of fuel).

Benefits

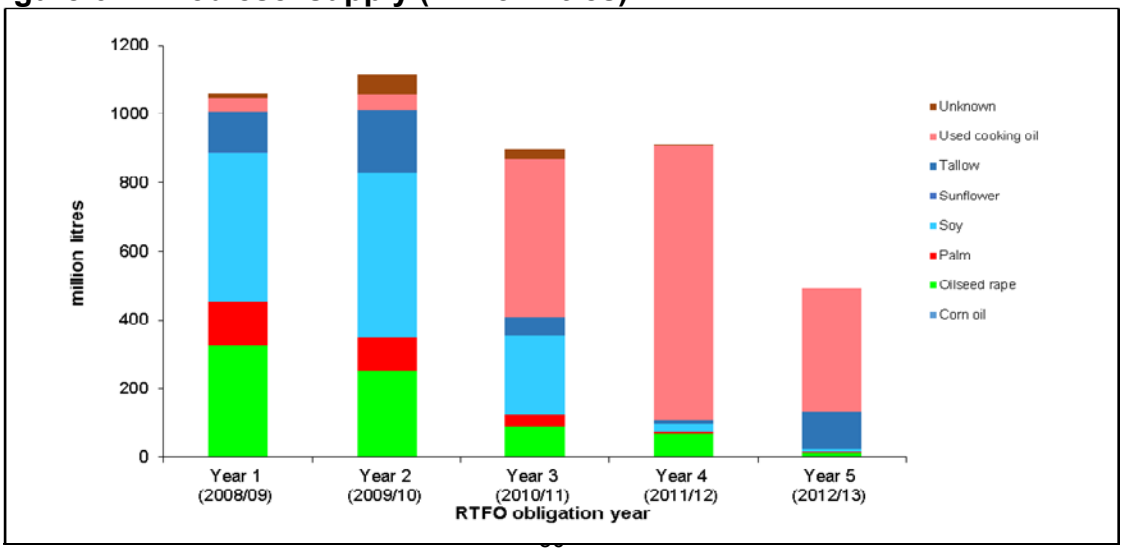
6.6 The impact assessment which accompanied double certification projected a small positive change in net RTFO GHG savings. This is because crop-derived biofuels (~36% average direct GHG saving) were assumed to be displaced from the RTFO fuel mix by waste-derived biofuels (~83% average GHG saving) at a rate of 2 to 1.

RTFO performance

RTFO biofuel supply

6.7 Looking at historical RTFO supply data, it is difficult to isolate the impacts of double certification on the make-up of the RTFO biofuel supply due to a fuel duty differential which was in place for used cooking oil (UCO) derived biodiesel over the period April 2010 to April 2012, prior to the introduction of double certification in December 2011. The duty differential significantly increased the supply of UCO-derived biodiesel over this period (as can be seen in Figure 6.1). However, if the biofuel supply prior to April 2010 (i.e. before the UCO only duty differential was introduced) is compared to the biofuel supply post-April 2014 (i.e. after the UCO only duty differential was removed and double certification introduced) it can be seen that the composition of the biofuel supply has changed markedly. Prior to April 2010 the RTFO biofuel supply (by volume) was made up of 14% double certified materials (20% of biodiesel). After the policy change this proportion increased to 40% (96% of biodiesel). This impact is in between what was predicted in the central and high scenarios in the impact assessment which accompanied the amending legislation.

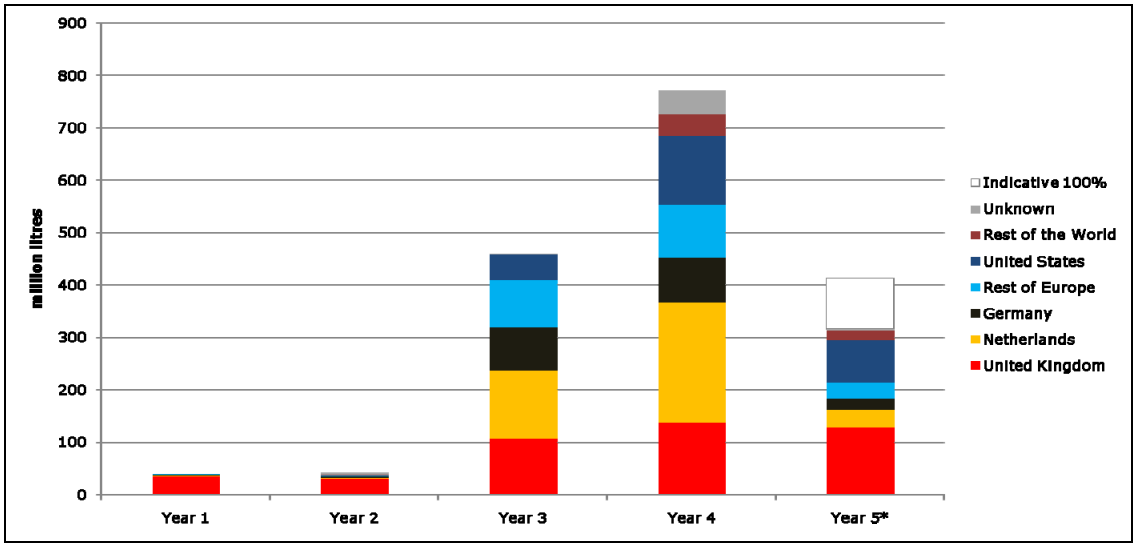
Figure 6.1: Biodiesel supply (million litres)



6.8 There has been a significant increase in the supply of 'first generation' double certified biofuels derived from waste oils (e.g. UCO and tallow derived biodiesel, and methanol derived from crude glycerine), although there has been little observed investment in advanced biofuel production capacity, which suggests that the future supply of these fuels may fall short of the projections in the central scenario in the impact assessment. There has also been relatively low growth in the supply of waste-derived biomethane which is also double counted.

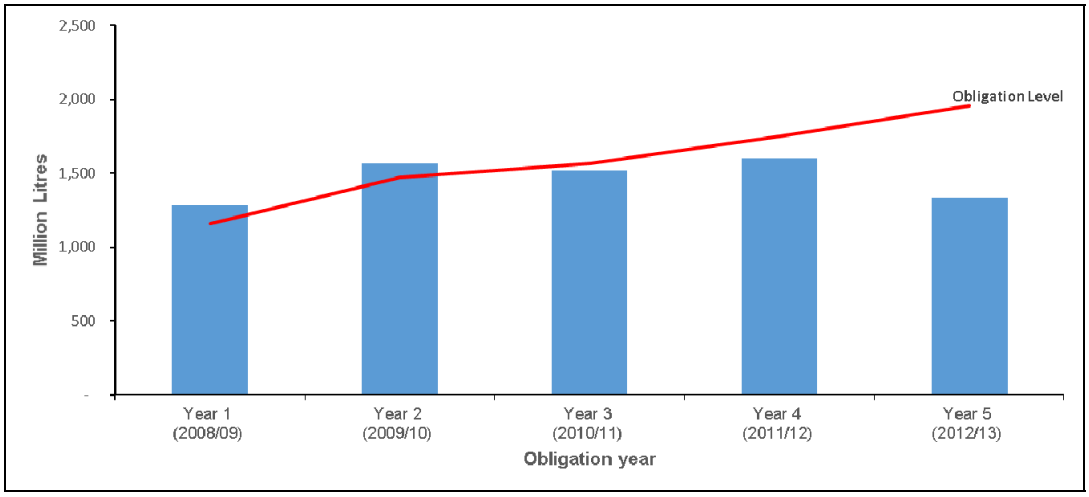
6.9 Figure 6.2 illustrates the sources of UCO supply over the period. It can been seen that the duty differential stimulated significant imports of UCO supply in addition to increased UK supply. The chart also illustrates a further significant increase in UCO supply In Year 4, which included a period from December 2011 to April 2012 when both a duty incentive and double certification were in place. Notably, UK UCO supply in Year 5 has thus far maintained the level achieved in Years 3 and 4 following the removal of the duty incentive and introduction of double certification.

Figure 6.2: Sources of UCO supply (million litres)



6.10 In line with the original impact assessment, it would appear that double certification has also led to a fall in the overall volume of biofuel supplied under the RTFO as suppliers can fulfil their obligation with less fuel. This can be seen in Figure 6.3 below which shows actual biofuel supply levels relative to what would have been required under the RTFO in the absence of double certification.

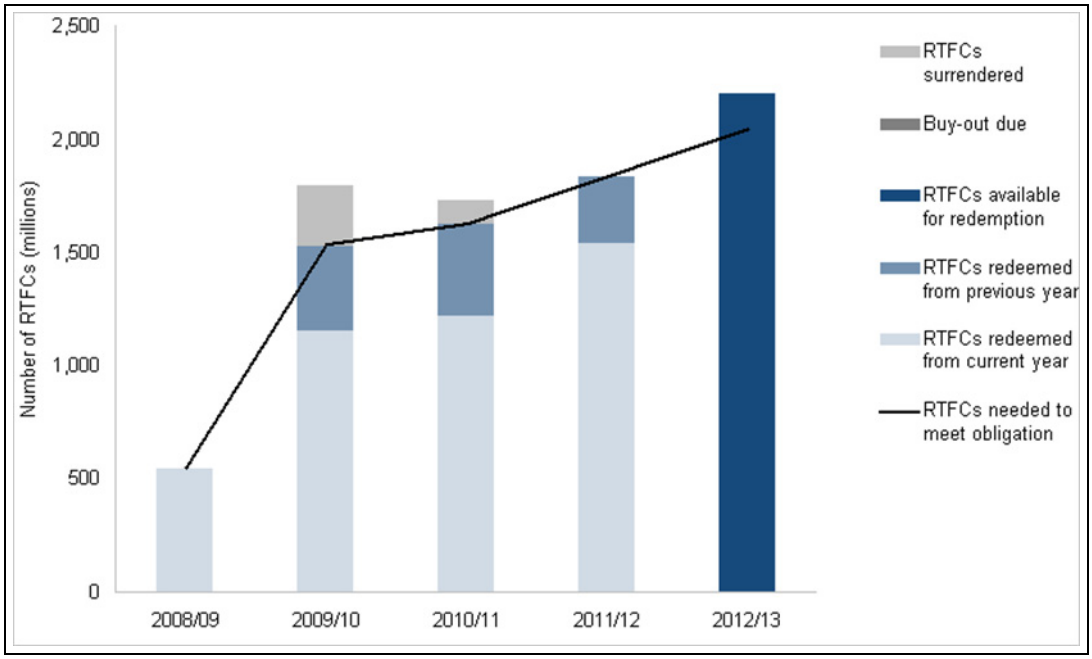
Figure 6.3: Actual fuel supply and obligation level*



*Obligation levels calculated in absence of double counting

6.11 As outlined in chapter 2, the figure below illustrates the how the obligation has been met each year through the redemption of RTFCs, including following the introduction of double counting.

Figure 6.4: RTFCs and obligation level

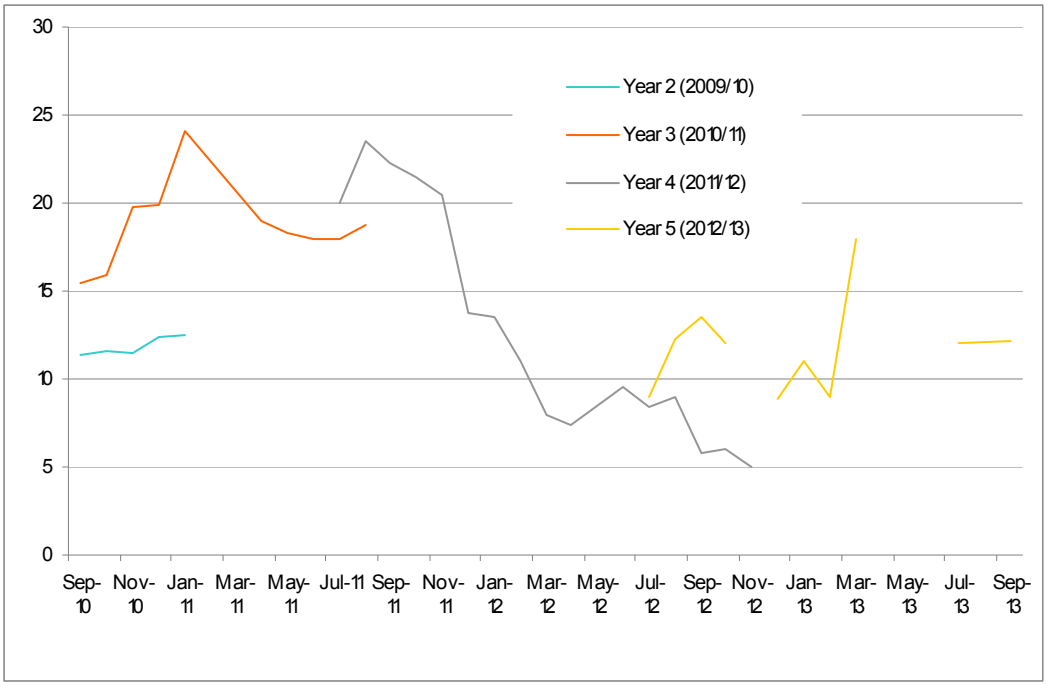


Costs

6.12 Following the introduction of double certification, the RTFC price dropped (as can be seen in the 'Year 4' series of Figure 6.5) and crop-derived biodiesel reduced (from 6% in Year 4a to 2% of total biofuel so far in Year 5) from the RTFO biofuel mix. This may have reflected an oversupply of certificates caused by a combination of double counting and the duty differential but could also reflect a fall in the cost of meeting the RTFO. The certificate price has since recovered and some crop biodiesel has been seen in the RTFO biofuel supply mix which suggests

that scarcity of double counted materials may have been driving up the price in line with suppliers' willingness to pay.

Figure 6.5 RTFC prices over time

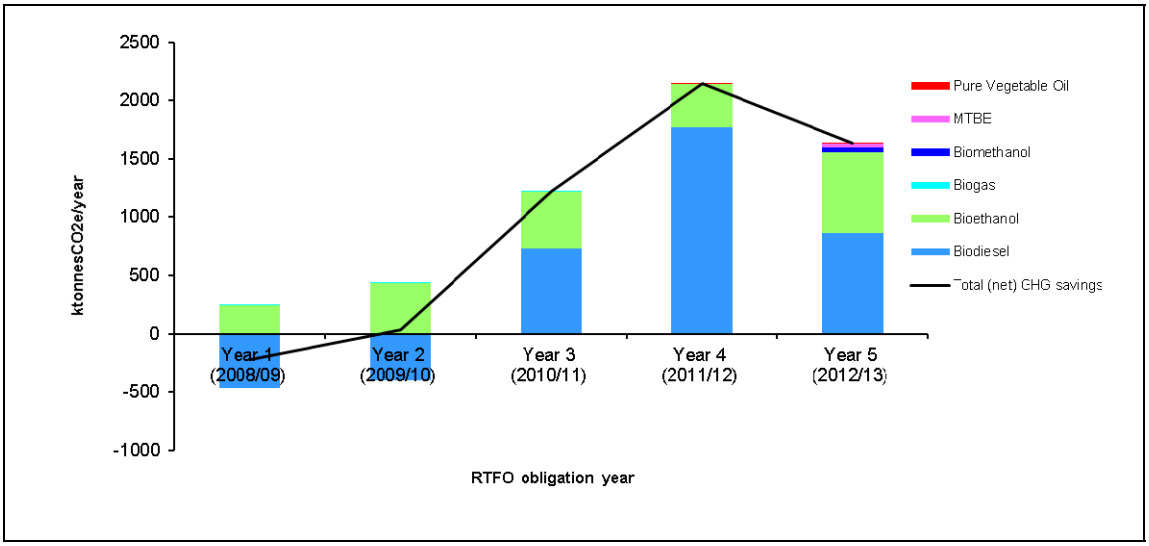


Benefits

6.13 Figure 6.6 shows the GHG savings (inclusive of ILUC impacts) delivered by the RTFO since its inception in 2008. Aggregate RTFO GHG savings increased from -220 $MTCO_2$ in Year 2 to (+) 1555 $MTCO_2$ in Year 5. Average GHG savings (including ILUC) increased from 1% (saving relative to petrol/diesel) to 56% between Year 2 and Year 5.

6.14 The 2011 impact assessment did not take into account GHG emissions from ILUC which are typically high for crop-derived biodiesel and low for waste-derived biofuels. Therefore the full beneficial impact of double certification was underestimated.

Figure 6.6 RTFO GHG savings (inclusive of ILUC impacts)



Questions

Q 6.1 How has double counting affected your business?

Q 6.2 Do you anticipate supplying new kinds of waste/non-agricultural residue/other double counting biofuels?

Q 6.3 Are you investing or considering investing in new production or supply as a result of double counting?

Q 6.4 Do you consider that there have been any unintended consequences as a result of the double counting of waste based biofuels in the RTFO?

7. Industry impacts and economic effects

Introduction

7.1 The RTFO affects a number of industry groups, most obviously obligated fuel suppliers, but also others in the fuel production and supply industry including biofuel producers, fuel retailers and the farming industry.

7.2 This section considers the impact that the RTFO has made on the various parts of industry over the period, including following the implementation of the amendments in 2011. It encompasses the small firms assessment and the competition assessment.

Original RIA

Competition assessment

7.3 The original impact assessment anticipated that the RTFO would have a significant impact on the fuel market but, as it applied across the industry in a competitive environment, did not consider that it would negatively affect the competitiveness of the fossil fuel or emerging biofuel markets.

7.4 The assessment noted that the biofuel market was at that time very new, but that there was growing UK capacity, particularly for biodiesel. This consisted mostly of a small cottage industry, but three major plants were in operation and a number of others were in the development or construction stages.

7.5 The RTFO was anticipated to further develop and mainstream the biofuel market in the UK, and lead to both increased imported biofuels and domestic capacity, though this was not quantified.

Small firms assessment

7.6 Three types of smaller firms were identified as being impacted:

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

Retailers would be impacted by the need for a one-off clean of their tanks.

7.7 The renewable fuel producers and the producers of feedstock crops were anticipated to have an expanded market for their fuels which was

considered to be a significant opportunity for both farmers and biofuel producers. Smaller producer/suppliers would be able to earn certificates. Registration and compliance costs were not anticipated to be overly burdensome. However, the assessment noted that as with any new and emerging market, the cottage industry was likely to be replaced in time with large scale industry.

2011 RED amendments

Verification requirements

7.8 It was noted the verification requirements would add fixed costs on suppliers which might impact smaller suppliers disproportionately. However, as verification was relatively straight-forward for the UCO derived fuel that the majority of smaller firms supplied, the additional administrative burden was expected to be minimal and have no substantial impacts on small firms relative to other suppliers.

Double counting

7.9 Double certification of waste derived fuels was anticipated to increase opportunities for greater competition in the biofuels market, as smaller suppliers of waste derived fuels were anticipated to have a greater opportunity to capture market share of overall demand. It was also expected to give an advantage to suppliers of waste derived biofuels over suppliers of crop based biofuels.

7.10 Double certification was expected to improve the cash flow of small firms supplying waste derived fuel through increasing the revenues they could earn. This was anticipated to 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.

Sustainability criteria

7.11 The impact assessment noted that increased sustainability of biofuels supplied in the UK could incentivise greater UK production of biofuels because the majority of UK supply already met sustainability criteria. It was suggested that this could lead to greater output and employment opportunities in agriculture and biofuel production, though these were not quantified.

7.12 It was further noted that smaller suppliers might benefit from the potential expanded market of UCO derived fuel as it did not have to meet the strict sustainability criteria for crop derived feedstocks.

Partial renewables

7.13 The widening of the RTFO to provide access to partially renewable fuels increased the options available to suppliers to meet their obligations and therefore increase the competition among the types of fuels supplied. As no additional obligations were placed on suppliers, no adverse competition effects were expected.

7.14 It was considered that small firms might also benefit through new market opportunities.

Review results

7.15 The Department for Transport (The Department) commissioned Ecofys to produce an overview of the UK biofuel sector, as input to the review. The report provides an overview of the biofuel production plants operating in the UK, along with insights into the challenges the industry faces, particularly focusing on smaller biofuel producers, and finally industry's recommendations for improving the RTFO. Draft results are summarised here, the full draft report is published alongside this review.

7.16 In addition, data from the RTFO operating system, ROS, has been analysed to review the number and market share of SME suppliers operating in the RTFO over the period.

Competition assessment

7.17 The structure of the fuel supply industry has developed significantly over the period since the RTFO's introduction, for example with extensive changes to refinery ownership. However, it remains a competitive market and domestic production faces significant competition from imports.

7.18 UK biofuel production capacity has grown considerably over the period particularly for bioethanol, with a number of large scale commercial production facilities coming online.

7.19 Actual biofuel production has been lower than the total capacity over this period. There are several reasons for this, including the availability of cheaper imports from outside the EU and over-capacity of biodiesel production in general in Europe.

7.20 The RTFO has had a mixed effect for UK industry in a competitive market. Some large producers have struggled, for example the 400 million litres a year ethanol plant now owned by Crop Energies AG (formerly Ensus) has been shut down three times since opening in 2010. Market conditions have been challenging, including cheaper bioethanol imports from the USA. This closure was scheduled to last four months, but in the end lasted 15, attributed in part to a poor UK wheat harvest in 2012 and rising gas prices.

Small firms assessment

7.21 Suppliers of fuels pay road fuel duty to HMRC using either deferred duty accounts using 'HO10' forms, or 'H0930' forms. Typically, the major suppliers use the former and smaller suppliers use the latter. A few larger supplier producers supply some fuel direct to the market using HO930 forms.

7.22 The table below shows data on biodiesel and biogas H0930 suppliers under the RTFO. Market share has varied over the period, increasing slightly from 1.2% in Year 1 to 1.3% in Year 5. The proportion of HO930 supply amongst the top three HO930 suppliers has increased steadily,

from 22% in Year 1 to 77% in Year 5, whilst at the same time the active HO9030s has decreased from 40 in Year 1 to 18 in Year 5 (over the period, a total of 63 suppliers have been registered). Taken together with the analysis in chapter 6 demonstrating that UK UCO supply (Figure 6.2) levels have been consistent since Year 3, the data suggests that there has been significant consolidation within the market.

Table 7.1: HO930 biodiesel & biogas suppliers under the RTFO over time

	Year 1 2008/09	Year 2 2009/10	Year 3 2010/11	Year 4 2011/12	Year 5 2012/13	Total
Supply as a proportion of total biofuels	1.2%	0.5%	0.8%	0.9%	1.3%	
Of which from top 3 HO930 supply	0.3%	0.3%	0.6%	0.7%	1.0%	
Proportion of HO930 supplied by top 3 HO930 suppliers	22%	51%	75%	75%	77%	
Active HO930's	40	34	30	29	18	63*

*This is the total number of biodiesel and biogas HO930 suppliers that have been registered on ROS throughout the period.

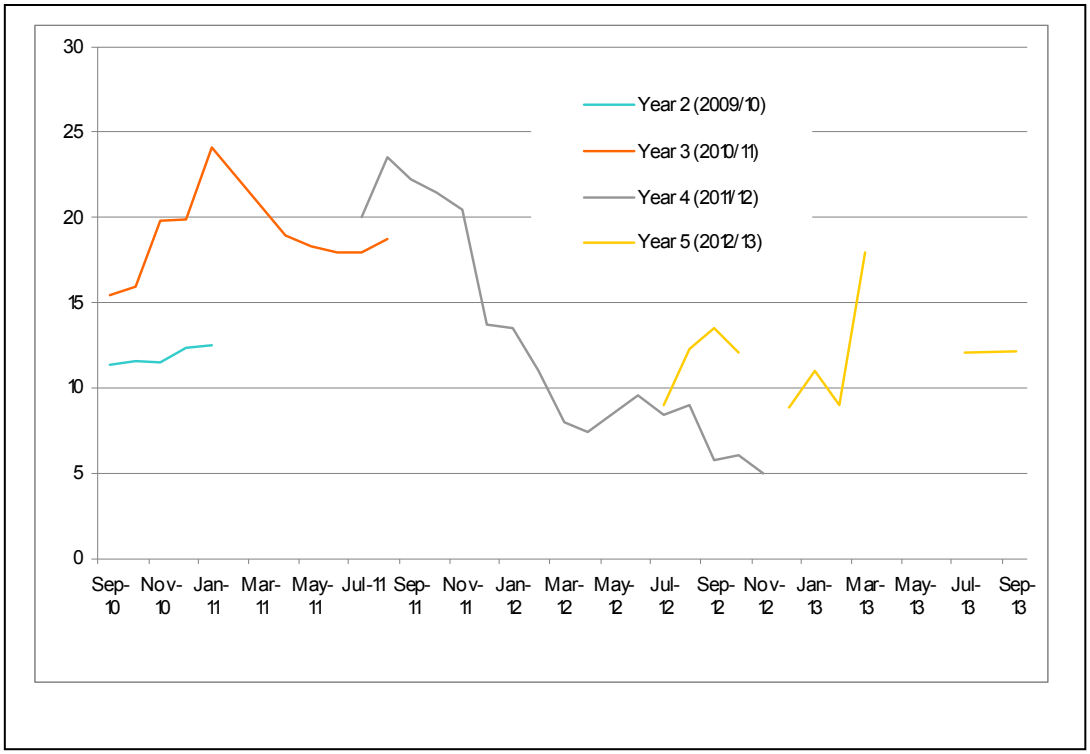
7.23 Ecofys undertook a review of UK biodiesel suppliers as part of their mar review. This included all suppliers registered on ROS (not just HO930 suppliers as in the table above). They found that out of a total of 65 UK biodiesel companies currently registered in the RTFO ROS operating system, 14 are now understood to be producing biodiesel, and nine of these are small producers.

7.24 The Ecofys report and an earlier report commissioned by the UK small biodiesel association (UKSBA) provide some insight into what has happened to the remainder of these firms and the reasons why. At least 16 suppliers appear not be operating as they are no longer registered at Companies House. The status of a further 24 companies is unknown but there has been no recent activity under the RTFO and a further supplier is understood to have ceased trading. The remainder of suppliers have diversified into related activities. For example two are now focussing on waste oil collection, three are supplying bioliquids and three on equipment sales.

7.25 Overall support available to smaller suppliers appears to have been a key issue. Prior to the RTFO suppliers benefited from a 0.20p per litre duty differential which was guaranteed. Following the introduction of the RTFO and until the duty incentive ended for UCO biodiesel in April 2012, suppliers were additionally able to earn an income from selling RTFCs.

7.26 The value of RTFCs are not fixed however as they are determined by the market. As illustrated in Figure 7.1 below, traded values have fluctuated widely from month to month.

Figure 7.1: Historical RTFC prices



7.27 RTFC e-toc average price data as traded by NFPAS. Note that gaps in the line in Year 5 indicate that no RTFCs were traded in those months (e.g. Nov-12). Units: pence per RTFC (i.e. per litre, or per 0.5 litres for double counting biofuel).

7.28 The overall effect of this is that support for UCO biodiesel initially increased when the RTFO was first introduced, more than doubling overall support in periods during Years 3 and 4 of the RTFO. Following the removal of the incentive support has fallen back, with double incentives support has typically been between 18-24p per litre.

7.29 Raw material prices paid to UCO collectors also rose sharply over the period. This may in part be related to the significant increase in incentives for UCO biodiesel following the RTFO's introduction, and particularly in Year 3 when the duty incentive applied to UCO biodiesel but not to other biodiesel. As illustrated in the supply charts in chapter 6, UCO supply increased significantly in this period both for UK supply and for imports.

7.30 In addition to a reduction in the overall level of effective subsidy since double counting replaced the duty incentive, cashflow was cited by smaller suppliers as their most significant challenge. Whereas the duty incentive offered immediate, guaranteed, support, under the RTFO there is a time lag between suppliers supplying fuel and then receiving and selling their RTFCs. In January 2013 the RTFO Administrator implemented changes to speed up the process of issuing RTFCs, allowing applicants to supply evidence that the duty has been paid to HMRC, along with a verifier's assurance report, ahead of official notification of this from HMRC which had been required previously.

7.31 Smaller producers interviewed for the review indicated that the cost of verification is significant and, although the process is becoming easier over time, the cost per assurance engagement is not lower. Companies also indicated that, between verification costs and cash flow, cash flow is the more significant challenge that they have to deal with. However, the suppliers interviewed for the review were those that were still operating, so it is possible that verification may have been a more significant issue for those that went out of business.

Industry recommendations for developing the RTFO

7.32 Industry has made a range of recommendations to modify the RTFO. All parts of industry have called for an increasing supply trajectory towards the 10% target for 2020 required by the RED. This would provide greater certainty for investment and a growing market. However, the government has not wanted to raise targets until ILUC concerns have been addressed. At EU level negotiations on ILUC are currently ongoing.

7.33 Small suppliers have called for a range of developments including:

- Minimum prices for RTF certificates of 15ppl (i.e. 30 ppl support for UCO)
- Award of additional RTFCs for high blend biofuels
- A 'split obligation' to require both biodiesel and bioethanol supply.

7.34 As with any legislative amendment, a strong business case would be required to amend the RTFO demonstrating the cost effectiveness of any proposed changes. The Bioenergy Strategy set four principles for bioenergy policy that policy needs to be assessed against:

- Bioenergy should deliver genuine carbon reductions, including indirect emissions;
- Bioenergy should make a cost effective contribution to UK carbon emission objectives;
- Support for bioenergy should aim to maximise the overall benefits and minimise costs across the economy;
- Policy makers should assess the impact of biofuel deployment, including on food security, biodiversity and so on.

7.35 The Department welcomes suggestions for improvements to the RTFO and evidence on how the improvements would meet the criteria for the Government's bioenergy policy outlined above.

Conclusions

7.36 The RTFO has brought about a mainstreaming of the biofuel supply industry. Major production plants have been developed and bioethanol supply and production capacity have increased considerably. The market appears to be highly competitive, and some domestic production has struggled against imported fuels.

7.37 There is evidence of consolidation within the UK market, with the smallest producers struggling following the removal of the duty incentive, whilst market share amongst H0930 suppliers has been broadly maintained. Double certification has been effective to date in maintaining an incentive to supply waste derived fuels overall, with UK sourced UCO maintaining the highs of Years 3 and 4 of the RTFO. Some smaller suppliers have diversified and focused on related activities such UCO collection, and others have gone out of business.

7.38 The difficulties for some smaller suppliers appears to be partly due to a reduction in the overall level of support, partly to cash flow from the additional time it takes to realise value from RTFCs, and partly to increases in the costs of the feedstock (possibly related to the high level of incentives) and verification costs required by the RTFO.

7.39 Administrative changes to the operation of the RTFO have been successful in reducing the time it takes for smaller suppliers to receive RTFCs.

7.40 The main calls from industry to improve the RTFO have been to set a target supply trajectory towards the RED target of 10% in 2020 to provide greater certainty. Smaller producers have called for a variety of measures to increase support for UK UCO supply. Policy development in this area would need to be assessed against the criteria set out in the Bioenergy Strategy. The Department welcomes suggestions for improving the RTFO and evidence as to how any proposals would meet the criteria.

Questions

Q 7.1 Approximately how much has your company invested in order to produce/supply biofuels following the introduction of the RTFO and subsequent RED implementation?

Q 7.2 Does the RTFO provide a level playing field for all biofuel producers and suppliers? If not, how could this be improved?

Q 7.3 Does the RTFO contribute to a stable market for biofuel production and supply in the UK with sufficient certainty for investors? How could this be improved?

Q 7.4 How does the UK biofuel market compare to other European markets in terms of attractiveness of investment?

Q 7.5 Do you typically trade/ sell your RTF certificates at a published market value (i.e. traded prices stated on RTFC on line auctioneer websites)

Q 7.6 How would you develop the RTFO further?

Q 7.7 How would any proposed developments meet the criteria set out in the bioenergy strategy?

8. Wider impacts

Impact assessments expectations

8.1 Both the original impact assessment and those accompanying the 2011 amendments anticipated a number of non-monetised costs and benefits which have not been considered elsewhere in this draft PIR. The Department is interested in seeking your views, and evidence, where available, on whether these have been realised. These will be considered and reflected in the final PIR. These areas for consideration are set out in the following sections.

Market/employment opportunities

8.2 At the time of the original impact assessment, the UK had the capacity to produce 334 million litres of biofuel at major plants, not including small plants. Facilities under construction were expected to add a further 774 million litres by 2008. It was estimated that a 100 million litre biodiesel processing plant would create/sustain 200 jobs in farming and 62 jobs at the plant itself. If the plants were supplied entirely by feedstock produced in the UK, this would equate to 2,200 farming jobs and 682 jobs at the plants.

8.3 A separate report – UK biofuel industry overview – by Ecofys accompanies this draft PIR which considers the impacts on UK industry of the RTFO. Comments are invited and will be reflected in the final PIR.

Figure 8.1: Location of large-scale bio-refineries

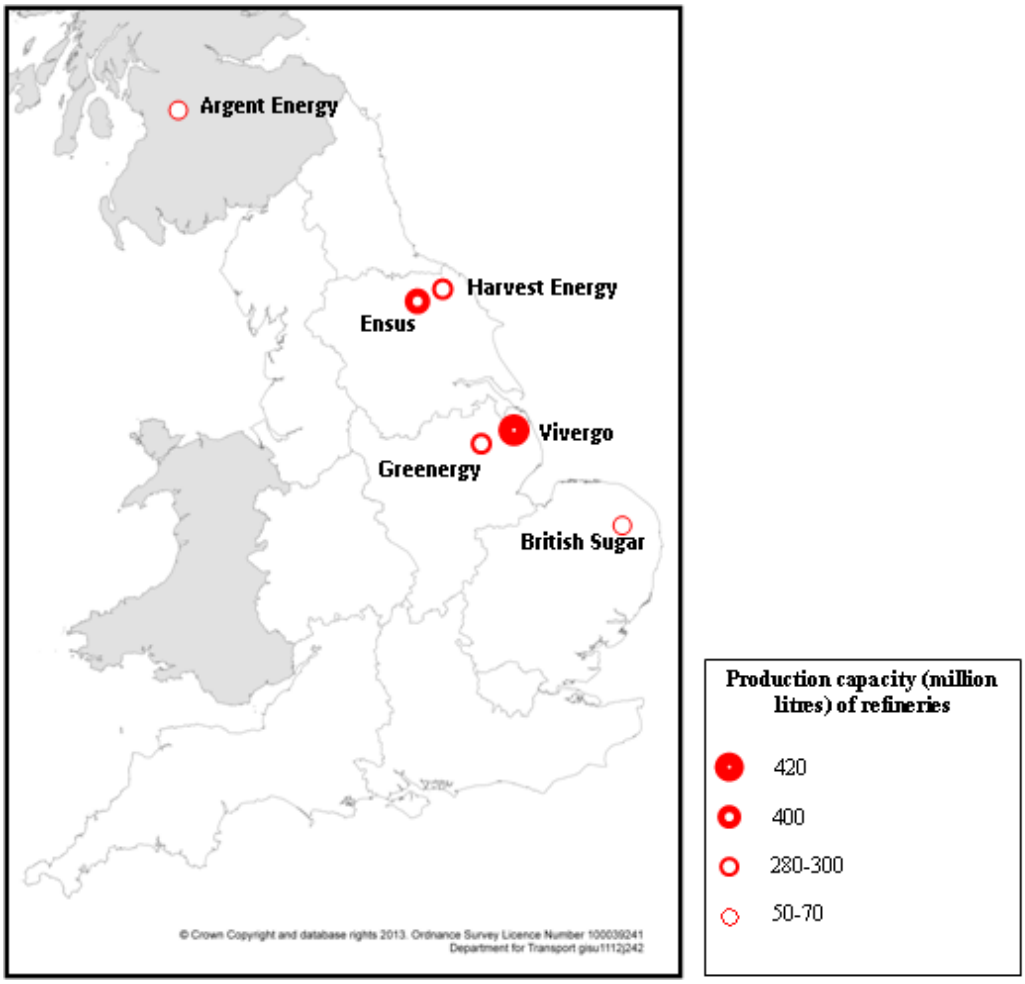


Table 8.1: Information on large-scale biorefineries				
Company	**Location**	**Capacity (million litres)**	**Year of Operation**	**Type**
British Sugar	Wissington, Norfolk	70	2007	Bioethanol
Argent Energy	Motherwell, Scotland	50	2005	Biodiesel
Ensus	Wilton, Teesside	400	2009	Bioethanol
Greenergy	Immingham, Hull	300	2006	Biodiesel
Vivergo	Hull	420	2013	Bioethanol
Harvest Energy	Seal Sands, Teesside	284	2006	Biodiesel

8.4 The report notes that total UK biofuel production capacity has increased significantly and is now in excess of 1,500 million litres per year, of which 60% is bioethanol and 40% biodiesel (with a small volume of biomethane). Actual production to date has been below capacity.

8.5 Whilst a number of small biodiesel operators have closed, others have diversified into other business, or continue to supply biofuel but to other markets. Cashflow has been cited as a significant issue for smaller operators and the Administrator has moved to speed up the issue of certificates to help to smooth this where possible.

8.6 The Ecofys report on industry quotes a joint study by the REA and Innovas which estimates that 3,500 jobs are supported by the UK biofuel industry across the supply chain (including production, supply and distribution – but not including feedstock collection). Analysis undertaken by Ecofys indicates that around 517 people are directly employed at the main UK biofuel plants, which, in turn, supports additional jobs in sectors such as farming, transport and distribution. They estimate that several thousand jobs are supported by the UCO collection industry.

Diversity and security of national fuel supply

8.7 The Impact assessments noted that increased biofuel supply could contribute to diversity and security of national fuel supply, for example, through sourcing biofuels and feedstocks from a wider range of countries.

8.8 Data was not available on the origin of biofuels supplied into the UK prior to the RTFO: the original IA noted that in terms of vegetable oil imports just four countries (Papua New Guinea, Indonesia, Malaysia and Colombia) provided around 85% of the UK's imports of palm oil and four countries (France, Belgium, Finland and the Netherlands) provided over 90% of the UK's imports of rape oil. However, total biofuel supply was very low and at the time could not, therefore, contribute to diversity or security of national fuel supply.

8.9 Since the RTFO was implemented, biofuel has been sourced from an increasing number of countries (55 in the latest supply) which helps contribute to security of national fuel supply, as does the increase in UK production capacity discussed above. The supply of biofuels other than biodiesel and bioethanol has been limited thus far.

Innovation

8.10 The original impact assessment noted that the policy was likely to have a positive impact on innovation as new and cheaper ways of producing biofuels and improving carbon savings are developed.

8.11 The impact assessment for the 2011 amendments noted that double counting may increase investment and innovation in the production of advanced biofuels as this would become more profitable. Other emerging technologies were also expected to benefit. Increased profitability for producers of these fuels was therefore likely, but this was not possible to quantify.

8.12 The supply chain has been innovative in terms of sourcing new materials – the number of applications and queries regarding new materials to be considered as wastes has increased markedly over the last year. Whilst to date, advanced biofuels have not been supplied under the RTFO, new biofuel feedstocks include contaminated materials, food waste, the renewable component of tyres and low grade starch slurry, which is unusable material produced when starch is extracted from the wheat. Low grade starch slurry has already been supplied under the RTFO.

8.13 UK biofuel production facilities provide some excellent examples of innovation to deliver improved carbon savings. British Sugar, which produces bioethanol and sugar from sugar beet, minimises waste by recycling stones for building materials, soil for landscaping, and lime for soil conditioning. They utilise the left over beet pulp for animal feed, and use combustion gases and recovered heat from Wissington's CHP plant to grow over 140 million tomatoes annually. Ensus, which produces bioethanol from wheat, produce almost as much animal feed as ethanol which can replace imported soy feed. In addition, they capture waste CO_2 gases for use in the food, drinks and industrial markets.

Compliance

8.14 Suppliers and the wider industry have, on the whole, engaged and complied with the requirements of the RTFO. One supplier has been issued with a civil penalty for failing to meet their obligation and a small number of suppliers have been issued with civil penalties for late registration with the scheme.

8.15 The impact assessment for the RED amendments did not anticipate an increase in administrative burden other than potentially the need for increased anti-fraud measures. The costs for administrating the RTFO have been lower than expected – see Table 4.6 in the 'costs and cost effectiveness' chapter.

8.16 The RTFO Administrator has implemented counter fraud measures including checks on sustainability and volume claims made since the outset. These have been effective in driving improvements in industry practice as seen in improved data capture (pre-RED) leading to increased supply of demonstrably sustainable biofuel over time.

8.17 Following RED implementation the Administrator consulted on and implemented a sustainability compliance policy which sets out the approach to checking the accuracy of sustainability claims. This includes the Administrator checking a sample of evidence behind sustainability claims selected on a risk basis. The market has responded to this and other factors by moving to voluntary schemes which provide an extra level of assurance and reduce verification effort (as the verifier does not need to check claims all the way down the chain of custody).

8.18 One consequence of providing additional incentivises for biofuels derived from waste materials is an increased risk of fraud. Following RED implementation the Administrator noted that the volumes of used cooking oil (UCO) derived biofuel being reported as coming from the Netherlands were implausibly high based on the population size. As Rotterdam is the

main shipping port for Europe it is likely that significant quantities of UCO will pass through the Netherlands. It is therefore possible that the UCO was being misreported as of Dutch origin, rather than the material itself not being genuine UCO. Through communicating this risk, and enforcing the requirements for suppliers and verifiers to be able to trace material back to its origin to verify sustainability claims, the volume of Dutch UCO has decreased to realistic levels and there is greater assurance that virgin oils are not being passed off as wastes.

8.19 As used cooking oil volumes have increased significantly to become the main biodiesel feedstock, the Department asked Ecofys to produce a report to feed into this PIR on the UCO market and the impact of the RTFO. The report accompanies this draft PIR and comments are invited from stakeholders on its findings. The main conclusions are:

- Within the EU, ~90% of the collected UCO is used for biodiesel and ~10% by the oleochemical industry. UCO from certain controlled sectors of the food industry could still be used in animal feed, but it is believed that in the UK this potential is now used for biodiesel.
- It is estimated that up to 61% of total potential UK UCO is already being collected and supplied under the RTFO. Assuming some exports, this suggests that a large part of the UK UCO potential is already being collected and used for biodiesel. There remains, however, scope for increases in collection.
- The market for UCO collection is strong, prices have risen and UCO theft has become an issue.
- Voluntary scheme certification is being increasingly sought by the market but this carries an administrative burden.

Food and feed

8.20 The 2011 amendments impact assessments noted that there may be possible indirect impacts on food prices depending on the types of fuels supplied but these were not quantified. The double counting provisions were introduced to help increase supply of non-food biofuels (as well as reducing the impact of ILUC).

8.21 There are concerns over whether agricultural food products should be used for energy when there are people around the world suffering from hunger. There are also concerns that competition for the same product for fuel or feed increases prices which leads to increased poverty and hunger. Others argue that increased demand for agricultural products (e.g. for biofuel) will stimulate increased supply.

8.22 The proportion of biofuel supplied under the RTFO coming from feedstocks that could potentially be used for food or feed has decreased markedly over time – from 88% in Year 1 to 58% in Year 5.

8.23 Commodity prices in the UK for the three major crop based biofuel feedstocks for the period 2008 to 2010 are shown in Table 8.2.[39]

Table 8.2 Commodity prices in the UK for crop-based biofuel feedstocks, 2008-10

Crop	Price £/tonne				
	2008	2009	2010	2011	2012 (provisional)
Feed wheat	127	108	113	148	163
Oilseed rape*	319.6	248.7	302.3	402.3	385.6
Sugar beet $	27.3	29.1	30.1	29.6	31.1

* average market price (£ per adjusted tonne)
$ average weighted by volume of sales

8.24 To the extent that biofuels and biomass policies result in an increase in aggregate demand for agricultural feedstocks and/or agricultural land, they would be expected to result in higher agricultural product prices than would otherwise have been the case. This appears only to have led to a modest rise in food prices, since crops represent only a small share of the cost of food production. The impact of biofuels on crop prices is small compared to the impact of changing agricultural input costs such as fertiliser prices.

8.25 Analysis by Defra's modelling team using the OECD-FAO Aglink-Cosimo model suggests that the absence of biofuels support at the EU level could have a modest (yet significant) medium-term price reduction impact on the feedstocks used for biofuels production[40]. For example, in the absence of EU support for biofuels, on average over the projection period, projected EU wheat prices are around 7% lower than in the baseline scenario, vegetable oil prices around 12% lower on average, and oilseed prices approximately 4% lower than baseline levels. This is broadly consistent with earlier modelling by the OECD (2008).

8.26 The projected impacts of the effect of US biofuel support is larger than EU biofuel support. This is mainly because bioethanol is mostly produced from one feedstock in the US (maize) rather than from a more diversified feedstock base as in the EU and secondly, due to the USA's large export share in global agricultural markets, particularly maize.

[39]Source Agriculture in the UK 2012 – https://www.gov.uk/government/publications/agriculture-in-the-united-kingdom-2012
[40]Defra, Removing Biofuel Support Policies: An Assessment of Projected Impacts on Global Agricultural Markets using the AGLINK-COSIMO model, 2012. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48345/5134-removing-biofuel-support-policies-an-assessment-o.pdf

8.27 Over and above medium term impacts on agricultural product prices, there is a distinct question about the extent to which biofuel policies have contributed to recent international agricultural price spikes. In that context, a thorough cross-Whitehall analysis of the agricultural price spikes of 2007/08[41] concluded that biofuels had a relatively small contribution in 2008, particularly as far as wheat was concerned. Nevertheless, the report also concluded that the additional global demand for biofuels has and will put upward pressure on the prices for those agricultural commodities used in biofuels production.

8.28 The cross-Whitehall report also raised a question about the extent to which the inelasticity of demand for biofuels makes an important segment of agricultural product demand more inelastic so that international prices are more volatile than they would otherwise be.

8.29 Increased demand for biofuels has primarily been driven by Government policies incentivising biofuel production rather than market developments such as rising oil prices. The future impacts of biofuels demand on agricultural crop prices will still depend to a large extent on policy developments. In the EU, negotiations are ongoing around how to address the indirect land use change (ILUC) effects of biofuels, and it seems likely that a cap will be placed on the contribution of food-based biofuels to renewable energy targets, with incentives for non-food based biofuel production (e.g. wastes and residues). Depending on the outcome of negotiations, and policy developments in other regions (especially the USA), the impact of biofuels on agricultural commodity prices may diminish in the future.

Impacts on the tallow market

8.30 Tallow is a product of the meat rendering process: in the EU it is classified by degree of quality, from high to low. Category 1 tallow presents a high risk for human health and has no alternative use aside from for energy purposes. It therefore counts as a waste and double counts under the RTFO. Category 2 can be used for soil enhancement and for technical purposes, and Category 3 has uses in animal feed, cosmetics and pet food. Tallow in Categories 2 and 3 do not double count.

8.31 It is important that incentivising wastes for energy purposes does not lead to significant negative impacts on other markets and/or indirectly lead to increased carbon emissions. As recognised in the RED amendments IA, in the case of tallow, an inadvertent impact might be that double counting Category 1 could create an incentive to produce more of this category thereby reducing the amount of Category 3 available for other industries. These sectors might replace tallow with oils from land based crops such as palm, potentially leading to further expansion of palm into lands with high carbon stocks.

[41] HMG. The 2007/8 Agricultural Price Spikes: Causes and Policy Implications, 2010 (http://archive.defra.gov.uk/foodfarm/food/security/price.htm. http://archive.defra.gov.uk/foodfarm/food/pdf/ag-price100105.pdf

8.32 In 2012 Ecofys produced a report on the behalf of the Department which concluded that, based on the available data, double counting of Category 1 tallow biodiesel was not having a detrimental effect on the volumes of UK Category 3 tallow produced. This report has been updated and the latest data and analysis supports the original conclusion. The report accompanies this PIR and the Department would like to seek views from stakeholders on the findings of this report which will feed into the final PIR. Further information on the supply of tallow over the course of the RTFO can also be found in the RED amendments: double certification chapter.

Biodiversity, water resources, water quality and soil quality

8.33 The Joint Nature Conservation Committee (JNCC), the UK Government's statutory advisor on UK and international nature conservation, commissioned a report in 2013 to look at the impacts on UK biodiversity from the production of biofuels and bioliquids from domestic feedstocks.

8.34 The report looked at the potential of using bird population data as a proxy for broader biodiversity. It considered the annual Breeding Bird Survey data collected and held by the British Trust for Ornithology (BTO), JNCC and the Royal Society for the Protection of Birds (RSPB), amongst other bird data sources. It also drew upon other experimental data (incorporating the Defra annual agricultural survey data), that could estimate the area of biofuel crops (oilseed rape, sugar beet, wheat) grown in 2010 in the UK and used for biofuel production in 2011 (these were the latest available data). Biofuel crops grown for export markets were not included in these data.

8.35 The Defra data estimate that there was a 363% increase in the biofuel crop area from 2009 to 2010, and although it was a large increase, this still only represented 1.7% of the total arable area of the UK in 2010. The area of land involved was therefore quite small.

8.36 The multiple potential markets for the crops involved also mean that it was highly unlikely that much change in crop composition across the agricultural landscape had been driven by biofuels. Additionally, agronomic management practices for both food/animal feed crops and biofuel crops (e.g. water inputs, fertiliser, herbicide, pesticide, cropping regime etc.) are currently similar, so it was considered that birds would not be affected any differently by a crop grown for conventional purposes or biofuel/bioliquid purposes.

8.37 For these reasons, although no analyses of the bird data were conducted, the report concluded that there was no evidence to suggest that biofuel or bioliquid production in the UK, using UK crops, was presently likely to be having an adverse impact on bird populations. Further, any effects on the agricultural landscape that could impact birds (and other biodiversity) would be due to changes in cropping driven by the broader crop markets, in which demand would reflect numerous other interacting influences, including biofuel/bioliquid demand.

8.38 The analysis in the report did however identify reasons to interpret the findings with caution. The reliability and completeness of the figures in the Defra annual agricultural survey had not been fully determined, despite much of their source being based on Government Statistics, and the methodologies for producing them were still evolving. The Breeding Bird Survey data are also better suited to analyses over periods longer than two years because of natural inter-annual fluctuations in bird numbers.

8.39 Looking forward, the report highlighted that marginal and idle land may be used for biofuel crops in the future, which could have an impact on bird populations (and other biodiversity) as some of these habitats have been shown to be important for certain bird species. Any such land-use changes should become apparent in future agricultural survey data collected by Defra, which could then be tested against the Breeding Bird Survey (or other) data.

8.40 The report also highlighted that, although future Defra agriculture data will incorporate more (later) years, the lag in reporting would mean that it will always be difficult to take the immediately preceding two years, as required by Article 22, into account. Initial indications were that changes in the landscape, due to crops used for biofuels and bioliquids, would be very small in the short to medium term. Therefore, the statistical power to detect effects at real 'conversion' rates was anticipated to be low. Some species would respond positively and some negatively to any given change.

8.41 The UK will continue to improve mechanisms to assess the impacts of biofuels and bioliquids on biodiversity for future reporting periods, but note that this assessment may be very difficult for the reasons described.

Improving the RTFO

8.42 A separate report accompanies this PIR on the UK biofuels industry undertaken by Ecofys for the Department. Following interviews with industry members Ecofys have collated a number of recommendations on how the RTFO could be improved. These include:

- Splitting the obligation by fuel type;
- Setting obligation trajectories to 2020;
- Setting a minimum RTFC price;
- Awarding additional RTFCs for high blend biofuels;
- A tax differential for UK UCO B100 producers;
- Linking RTFCs to GHG savings;
- Incentivise collection and recovery of wastes; and
- Pre-approval of biofuel (earlier issue of RTFCs).

8.43 The Department would like to seek your views on measures to improve the RTFO. In particular, we would be interested in measures which do

not increase the complexity of the system and hence the overall cost to the tax payer whilst delivering improved carbon savings.

Questions

Q 8.1 Has the RTFO had a beneficial effect on market/employment opportunities in agriculture e.g. through the cultivation of biofuel feedstocks?

Q 8.2 Has the RTFO had a beneficial effect on market / employment opportunities in biodiesel production and the wider UK biofuels industry?

Q 8.3 Has the RTFO had a beneficial effect on diversity and security of national fuel supply?

Q 8.4 Has the RTFO had a beneficial effect on innovation e.g. through developing technologies to improve the performance and production of biofuels, or with respect to advanced biofuels?

Q 8.5 Is the Administrator's approach to compliance working?

Q 8.6 Do you agree with the analysis and conclusions of the separate reports on:

- **the UCO market**
- **tallow**
- **the wider industry?**

Q 8.7 Have we captured all the impacts of the RTFO? Are there any costs or benefits that we have not considered which should be included in the final PIR?

Q 8.8 Do you have knowledge of any additional data/analysis which can be used to examine the impact of the RTFO on food and feed markets?

Please provide evidence where available.

Glossary

CHP – Combined Heat and Power
DECC – Department for Energy and Climate Change
DPA – Data Protection Act
EU – European Union
FOIA – Freedom of Information Act 2000
FQD – Fuel Quality Directive
GHG emissions – Greenhouse Gas emissions
HMRC – HM Revenue & Customs
ILUC – Indirect Land Use Change
IPCC – International Panel on Climate Change
ISAE 3000 – International Standard on Assurance Engagements
MTBE – Methyl Tert-Butyl Ether
PIR – Post Implementation Review
REA – Renewable Energy Association
RED – Renewable Energy Directive
RIA – Regulatory Impact Assessment
RTFC – Renewable Transport Fuel Certificate
RTFO – Renewable Transport Fuel Obligation
tCO_2e – tonnes of carbon dioxide equivalent
UCO – Used Cooking Oil
UKSBA – UK small biodiesel association
VAT – Value Added Tax

Annex A – Modelling assumptions

Biofuel supply data
Biofuel supply data for the RTFO has been taken from Department for Transport biofuel statistics.
https://www.gov.uk/government/collections/biofuels-statistics

Biofuel and fossil fuel price data
This data has been sourced from commercial data suppliers. We are not able to publish this data due to contractual restrictions.

GDP deflator
The GDP deflator was taken from the Office for Budget Responsibility.
https://www.gov.uk/government/publications/gdp-deflators-at-market-prices-and-money-gdp-march-2013

GHG saving data
GHG data for the RTFO has been taken from Department for Transport biofuel statistics.
https://www.gov.uk/government/collections/biofuels-statistics

ILUC factor assumptions
ILUC factors are based upon numbers published in an EU impact assessment.
http://ec.europa.eu/energy/renewables/biofuels/doc/biofuels/swd_2012_0343_ia_en.pdf

Average ILUC factors	***gCO_2/MJ***
Biodiesel	51
Bioethanol	8