Summary: Intervention & Options

Department /Agency:	Title: Impact Assessment of UK Renewable Energy Strategy URN 09D/683	
Stage: Strategy	**Version:**	**Date:** 13 July 2009
Related Publications: Renewable Energy Strategy; Associated independent research reports; Individual RES sectoral IAs; Analytical Annex to RES.		

Available to view or download at:

http://www.

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

This IA assesses the impact of policies needed to meet the UK's share of the EU 2020 renewable energy target. Government intervention is necessary because: there is underinvestment by the private sector in renewable technologies due to; uncertainty over costs and carbon prices longer term; barriers to entry; companies may not be able to capture all the benefits (positive externalities) of their R&D investment; information assymetries; and a shortage of external finance for businesses involved in risky R&D.

What are the policy objectives and the intended effects?

The objective of the EU target is to address the two problems of climate change and energy security. Renewable energy can reduce greenhouse gas emissions and can potentially contribute to security of supply over the medium to long term. It will also create signifcant employment opportunties in the reneawable energy sector. The policies set out are intended to deliver 15% of the UK's energy from renewable sources by 2020 across electricity, heat and transport (the UK share of the EU target for a 20% share of renewables in overall EU final energy consumption).

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

This IA considers 4 ways of meeting the target with a range of different contributions by sector. These are not exclusive and other combinations are possible. The ones chosen illustrate the trade-offs that exist between the different sectors. The scenarios have been assessed against the following criteria: cost-effectiveness; ability to deliver the required share of renewable energy by 2020; maximising carbon emissions reductions and compatibility with broader UK energy policy such as security of supply and sustainability. The lead scenario (A) is the one that best balances these factors.

When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects?

The UK is required to submit a National Action Plan to the EU detailing how we intend to meet the target. Progress will be reviewed by the Commission every 2 years.

Ministerial Sign-off For SELECT STAGE Impact Assessments:

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

Signed by the responsible Minister:

.....Date:

Summary: Analysis & Evidence

Policy Option: A	Description: Share of renewables by sector: 29% large scale electricity; 12% in heat; 10% transport. and 2% small scale electricity.

COSTS

ANNUAL COSTS	
One-off (Transition) **Yrs**	Description and scale of **key monetised costs** by 'main affected groups' Resource costs (net of cost of carbon in the large scale electricity sector) of around £4.2bn in 2020. Includes grid reinforcement and tranmission and distribution costs and cost of overcoming barriers to renewable heat. Costs are cumulative to 2030. Figure in brackets includes ancillary cost of reduced air quality.
£	
Average Annual Cost (excluding one-off)	**Total Cost** (PV) **£ 60bn (£61bn)**
£ 4.2bn	

Other **key non-monetised costs** by 'main affected groups' Cost itemised are resource costs. Costs not included are costs of other policy measures to meet the target; including costs of removing barriers in the electricity sector (other than grid costs); indirect costs to the economy of increased energy prices, all of which could be significant.

BENEFITS

ANNUAL BENEFITS	
One-off **Yrs**	Description and scale of **key monetised benefits** by 'main affected groups' Benefits are monetised carbon benefits from the replacement of fossil fuels in electricity gen, heating and transport. Carbon saved in the traded sector is netted off resource costs above valued at the carbon price. Carbon saved in the nontraded sector valued at the SPC. Overall carbon saved valued at £14bn to 2030.
£	
Average Annual Benefit (excluding one-off)	**Total Benefit** (PV) **£ 5bn (£7bn ancl)**
£ 0.3bn	

Other **key non-monetised benefits** by 'main affected groups' Non-monetised benefits include diversifying the energy mix; reducing dependence on fossil fuels; business and employment opportunities; reducing future Climate Change mitigation costs by bringing forward renewable technologies. Non-monetised costs include air quality, landscape and biodiversity.

Key Assumptions/Sensitivities/Risks A key assumption is the value of carbon assumed in the traded and non-traded sector. Using updated carbon values, the NPV of the scenario falls to -£50bn to 2030. Costs are based on central fossil fuel price assumptions. These and technology costs are uncertain going forward, implying considerable uncertainty around costs.

Price Base Year 2008	Time Period Years 20	**Net Benefit Range** (NPV) **£ -56bn**	**NET BENEFIT** (NPV Best estimate) **£ -56bn (-£55bn ancl)**

What is the geographic coverage of the policy/option?			UK	
On what date will the policy be implemented?			from 2010	
Which organisation(s) will enforce the policy?			DECC, DfT	
What is the total annual cost of enforcement for these organisations?			£ not known	
Does enforcement comply with Hampton principles?			Yes/No	
Will implementation go beyond minimum EU requirements?			Yes/No	
What is the value of the proposed offsetting measure per year?			£	
What is the value of changes in greenhouse gas emissions?			£ 8bn	
Will the proposal have a significant impact on competition?			Yes/No	
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium	Large
Are any of these organisations exempt?	Yes/No	Yes/No	N/A	N/A

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

Increase of £ Decrease of £ **Net Impact** **£**

Key: **Annual costs and benefits:** **(Net) Present**

Summary: Analysis & Evidence

Policy Option: B	Description: 32% Large Scale Electricity; 8.5% Heat; 8% Transport; 10%, 3.5% Small scale electricity; Small STP scheme

COSTS

ANNUAL COSTS	
One-off (Transition) **Yrs**	Description and scale of **key monetised costs** by 'main affected groups' Resource costs (net of cost of carbon in the large scale electricity sector) of around £4.7bn in 2020. Includes grid reinforcement and tranmission and distribution costs and cost of overcoming barriers to renewable heat. Costs are cumulative to 2030. Figure in brackets includes ancillary cost of reduced air quality.
£	
Average Annual Cost (excluding one-off)	
£ 4.8bn	**Total Cost** (PV) **£ 69bn (£70bn)**

Other **key non-monetised costs** by 'main affected groups' bnCost itemised are resource costs. Costs not included are costs of other policy measures to meet the target; including costs of removing barriers in the electricity sector (other than grid costs); indirect costs to the economy of increased energy prices, all of which could be significant.

BENEFITS

ANNUAL BENEFITS	
One-off **Yrs**	Description and scale of **key monetised benefits** by 'main affected groups' Benefits are monetised carbon benefits from the replacement of fossil fuels in electricity gen, heating and transport. Carbon saved in the LSE sector is netted off the resource costs above, valued at the carbon price. Carbon saved in the nontraded sector is valued at SPC. Overall carbon savings are £15bn by 2030.
£	
Average Annual Benefit (excluding one-off)	
£ 0.3bn	**Total Benefit** (PV) **£ 4bn (£6bn ancl)**

Other **key non-monetised benefits** by 'main affected groups' Non-monetised benefits include diversifying the energy mix; reducing dependence on fossil fuels; business and employment opportunities; reducing future Climate Change mitigation costs by bringing forward renewable technologies. Non-monetised costs include air quality, landscape and biodiversity.

Key Assumptions/Sensitivities/Risks Costs and benefits are based on central fossil fuel price assumptions. Estimates are based on modelling from Redpoint consultants, and Element Energy (electricity), NERA consultants (heat). Transport estimates are provided by Department for Transport (DfT). Drivers to costs are uncertain and estimates likely to change in future.

Price Base Year 2008	Time Period Years 20	**Net Benefit Range** (NPV) **£ -66bn**	**NET BENEFIT** (NPV Best estimate) **£ -66bn (-£65 ancl)**

What is the geographic coverage of the policy/option?			UK	
On what date will the policy be implemented?			from 2010	
Which organisation(s) will enforce the policy?			DECC, DfT	
What is the total annual cost of enforcement for these organisations?			£	
Does enforcement comply with Hampton principles?			Yes/No	
Will implementation go beyond minimum EU requirements?			Yes/No	
What is the value of the proposed offsetting measure per year?			£	
What is the value of changes in greenhouse gas emissions?			£	
Will the proposal have a significant impact on competition?			Yes/No	
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium	Large
Are any of these organisations exempt?	Yes/No	Yes/No	N/A	N/A

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

Increase of £ Decrease of £ **Net Impact £**

Key: **Annual costs and benefits:** **(Net) Present**

Summary: Analysis & Evidence

Policy Option: C	Description: 24% large scale electricity; 12% heat; 3.5% small scale electricity; 12% transport, small STP scheme

COSTS

ANNUAL COSTS	
One-off (Transition) **Yrs**	Description and scale of **key monetised costs** by 'main affected groups' Resource costs (net of cost of carbon in the large scale electricity sector) of around £4.3bn in 2020. Includes grid reinforcement and tranmission and distribution costs and cost of overcoming barriers to renewable heat. Costs are cumulative to 2030. Figure in brackets includes ancillary cost of reduced air quality.
£	
Average Annual Cost (excluding one-off)	**Total Cost** (PV) **£ 57bn (£58bn)**
£ 3.8bn	

Other **key non-monetised costs** by 'main affected groups' Cost itemised are resource costs. Costs not included are costs of other policy measures to meet the target; including costs of removing barriers in the electricity sector (other than grid costs); indirect costs to the economy of increased energy prices, all of which could be significant.

BENEFITS

ANNUAL BENEFITS	
One-off **Yrs**	Description and scale of **key monetised benefits** by 'main affected groups' Benefits are monetised carbon benefits from the replacement of fossil fuels in electricity gen, heating and transport. Carbon saved in the LSE sector is netted off the resource costs above, valued at the carbon price. Carbon saved in the nontraded sector is valued at SPC. Total carbon valued at £13bn by 2030.
£	
Average Annual Benefit (excluding one-off)	**Total Benefit** (PV) **£ 6bn (£9bn ancl)**
£ 0.4bn	

Other **key non-monetised benefits** by 'main affected groups' Non-monetised benefits include diversifying the energy mix; reducing dependence on fossil fuels; business and employment opportunities; reducing future Climate Change mitigation costs by bringing forward renewable technologies. Non-monetised costs include air quality, landscape and biodiversity.

Key Assumptions/Sensitivities/Risks Costs and benefits are estimated using central fossil fuel price assumptions. Estimates are based on modelling from Redpoint consultants, and Element Energy (electricity), NERA consultants (heat). Transport estimates are provided by DfT. Costs will depend on the precise instrument used to deliver the target.

Price Base Year 2008	Time Period Years 20	**Net Benefit Range** (NPV) **£ -£52bn**	**NET BENEFIT** (NPV Best estimate) **£ -£52bn (-£50bn ancl)**

What is the geographic coverage of the policy/option?			UK	
On what date will the policy be implemented?			from 2010	
Which organisation(s) will enforce the policy?			DECC, DfT	
What is the total annual cost of enforcement for these organisations?			£	
Does enforcement comply with Hampton principles?			Yes/No	
Will implementation go beyond minimum EU requirements?			Yes/No	
What is the value of the proposed offsetting measure per year?			£	
What is the value of changes in greenhouse gas emissions?			£	
Will the proposal have a significant impact on competition?			Yes/No	
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium	Large
Are any of these organisations exempt?	Yes/No	Yes/No	N/A	N/A

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

Increase of £ Decrease of £ **Net Impact £**

Key: **Annual costs and benefits:** **(Net) Present**

Summary: Analysis & Evidence

Policy Option: D	Description: 29% large scale electricity; 12% heat; 10% transport; 2% small scale electricity; trading.

COSTS

ANNUAL COSTS	
One-off (Transition) **Yrs**	Description and scale of **key monetised costs** by 'main affected groups' Resource costs (net of cost of carbon in the large scale electricity sector) of around £4bn in 2020. Includes grid reinforcement and tranmission and distribution costs and cost of overcoming barriers to renewable heat. Costs are cumulative to 2030. Figure in brackets includes ancillary cost of reduced air quality.
£	
Average Annual Cost (excluding one-off)	**Total Cost** (PV) **£ 57bn (£58bn)**
£ 4bn	

Other **key non-monetised costs** by 'main affected groups' bnCost itemised are resource costs. Costs not included are costs of other policy measures to meet the target; including costs of removing barriers in the electricity sector (other than grid costs); indirect costs to the economy of increased energy prices, all of which could be significant.

BENEFITS

ANNUAL BENEFITS	
One-off **Yrs**	Description and scale of **key monetised benefits** by 'main affected groups' Benefits are monetised carbon benefits from the replacement of fossil fuels in electricity gen, heating and transport. Carbon saved in the LSE sector is netted off the resource costs above, valued at the carbon price. Carbon saved in the nontraded sector is valued at the SPC. Overall carbon valued at £13bn by 2030.
£	
Average Annual Benefit (excluding one-off)	**Total Benefit** (PV) **£ 4bn (£5bn ancl)**
£ 0.3bn	

Other **key non-monetised benefits** by 'main affected groups' Non-monetised benefits include diversifying the energy mix; reducing dependence on fossil fuels; business and employment opportunities; reducing future Climate Change mitigation costs by bringing forward renewable technologies. Non-monetised costs include air quality, landscape and biodiversity.

Key Assumptions/Sensitivities/Risks Costs and benefits are estimated using central fossil fuel price assumptions. Estimates are based on modelling from Redpoint consultants, and Element Energy (electricity), NERA consultants (heat). Transport estimates are provided by Dept Transport. Costs will depend on the precise instrument used to deliver the target.

Price Base Year 2008	Time Period Years 20	**Net Benefit Range** (NPV) **£ -53bn**	**NET BENEFIT** (NPV Best estimate) **£ -53bn (-£53bn ancl)**

What is the geographic coverage of the policy/option?			uk	
On what date will the policy be implemented?			from 2010	
Which organisation(s) will enforce the policy?			DECC, DfT	
What is the total annual cost of enforcement for these organisations?			£	
Does enforcement comply with Hampton principles?			Yes/No	
Will implementation go beyond minimum EU requirements?			Yes/No	
What is the value of the proposed offsetting measure per year?			£	
What is the value of changes in greenhouse gas emissions?			£	
Will the proposal have a significant impact on competition?			Yes/No	
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium	Large
Are any of these organisations exempt?	Yes/No	Yes/No	N/A	N/A

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

Increase of £ Decrease of £ **Net Impact** **£**

Key: **Annual costs and benefits:** **(Net) Present Value**

Evidence Base (for summary sheets)

[Use this space (with a recommended maximum of 30 pages) to set out the evidence, analysis and detailed narrative from which you have generated your policy options or proposal. Ensure that the information is organised in such a way as to explain clearly the summary information on the preceding pages of this form.]

A. Strategic Overview

1. UK policy on renewable energy seeks to help address two key challenges: tackling climate change and ensuring security of supply. In order to address these two challenges Government helped secure agreement in the EU to an ambitious target to source 20% of the EU's energy from renewable sources by 2020. This includes a proposed target of 10% renewable energy in transport, which is binding on each Member State. Achieving this level of renewable energy in the UK has costs but will also provide significant business and employment opportunities in the new green economy with the potential to create up to half a million more jobs in the UK renewable energy sector.

2. This EU target is set out in the Renewable Energy Directive which came into force in May 2009. The Directive allocates the UK a target of 15% of energy to come from renewable sources by 2020, as the UK's contribution to the overall 20% EU target. This is a challenging target given the UK's current renewable energy use is less than 2%. Both the overall EU target and the transport "sub-target" are legally binding.

3. The Government consulted over Summer 2008 on how best to meet the UK's share of the 2020 target in the Renewable Energy Strategy consultation, and is now publishing a new Renewable Energy Strategy. This Impact Assessment (IA) accompanies the Strategy and considers the overall package of policies which could be used to deliver the UK share. More detail on the costs and benefits of the policies in each sector are set out in the attached Impact Assessment for the individual sectors: large scale electricity; heat, transport and small scale electricity. Some individual policies, such as the financial instruments, will be subject to separate consultation and impact assessments to consult on the detail.

4. The numbers set out in this IA represent Government current best estimates on the costs and benefits of policies to achieve the UK target. All estimates are subject to uncertainty around a range of key variables including: technology costs, fossil fuel prices, carbon prices, economic growth and energy demand. All underlying assumptions, including sensitivities, used in this and the individual sectoral IAs are published in the supporting documents to the RES Strategy.

Rationale for Government Intervention

5. There are a number of justifications for Government action to address market failures in the renewable energy sector. The Stern Review on the Economics of Climate Change[1] identified three areas of market failures and barriers in tackling GHG reductions.

6. The first of these is the carbon externality where GHG emissions impose an external cost to society which is not reflected in the decision of a polluter to emit. The Social Cost of Carbon is a monetary estimate of the damage to society of emitting GHGs. In this IA, we have used two estimates of these costs – further details are given in para 34.

[1] http://www.hm-treasury.gov.uk/sternreview_index.htm

7. The Emission trading Scheme (ETS) has introduced a specific traded price of carbon that GHG emitters have to pay, thus internalising the cost of carbon in their decision making. But the ETS only covers a part of emissions (electricity production and other heavy energy using sectors), and there are limits to the levels at which carbon prices can be used to address climate change.

8. Therefore investment in low carbon technologies – the second element of Climate Change measures identified by Stern – is also needed. The EU Renewable Energy Directive does this by committing the EU to meet 20% of its energy needs from renewable sources by 2020, with the UK's share agreed at 15%. There are a number of reasons by, even with a carbon price, the market will undertake less innovation in low carbon technologies than is optimal. New technologies can take a long time to develop in terms of their functionality, efficiency and affordability as well as their public acceptability. The need to overcome this time lag *in the timeframe required* is what underpins the EU Directive.

9. One reason for such time lags is that the innovation process often requires high upfront investment due to lengthy and costly research, with uncertain outcomes and payback periods, and which are therefore very risky. Investment in R&D, demonstration and deployment (RDD&D) is subject to positive externalities in the shape of new knowledge and skills which spread beyond the investor. As such the total benefits of renewables RDD&D are often difficult to appropriate, resulting in under investment in the economy as a whole. Government support in the form of grants and competitions as well as market/demand-driven support schemes can reduce the resulting undersupply of new technologies, speed up RDD&D where desirable and internalise the rewards associated with positive externalities.

10. The third area identified by Stern is the need to tackle other market failures and non-barriers. Relevant factors here include: investments are long term and there is a lot of uncertainty over the course of government policy and future carbon prices, increasing the risk and hence cost of new technologies; there is carbon 'lock-in' from existing forms of generation, making it difficult for green technologies to compete fairly – examples of these are grid and current transport infrastructure; and barriers to individuals and investors in the form of lack of sufficient information, experience or knowledge of alternatives. The measures contained in the RES aim to address these issues too.

11. Renewables are needed as part of the global effort to reduce emissions and Government support is necessary because they are unlikely to be brought through with the carbon price until deeper emissions reductions targets are agreed globally and also because of the other market failures and barriers detailed above. The need for urgency and risk of higher damage costs in the future underpin the need for action now.

12. In some sectors - particularly electricity generation - where new technologies can struggle to compete with conventional technologies, policies to support the market for early-stage technologies is critical. The cost of deploying new technologies typically falls as volumes increase, supply chains are established, and commitments to further expansion rise. Moreover, the importance of innovation in low-carbon technologies, including renewables, has been underlined by a recent report from the UK Energy Research Council[2] It compared the cost of meeting the 2050 target with and without the accelerated development of seven low-carbon technologies, of which 4 are

[2] 2] UKERC, 2009, Decarbonising the UK Energy System: Accelerated Development of Low-Carbon Energy Supply Technologies

renewable. UKERC found that accelerated development of low-carbon technologies could reduce the cost of meeting the 2050 target by £36bn over 2010-2050. The Committee on Climate Change report Change report[3] suggests that renewable technologies will play an important role in decarbonising the electricity sector without an unduly high cost penalty. In addition, macroeconomic modelling by HMRC, has found that a higher rate of cost reduction (an increase in the learning rate from 5% to 6%) in wind generation could reduce the GDP losses associated with climate change policies in 2020 by around 0.05% of GDP, or around £1bn.

13. Renewable energy will play an important role in global carbon abatement. Accelerated development of zero / low carbon emissions technologies could have a considerable impact in reducing global marginal abatement costs in the medium term.

B. Objectives

14. The objective of this Strategy is to set out the policies Government intends to implement to achieve the target of producing 15% of the UK's energy needs from renewable sources. There are a number of criteria that have been used to assess the different ways of meeting the target. These include: cost and impact on prices; ability to deliver renewable energy in the time frame required; impact on carbon emissions reductions; security of supply; sustainability and investor confidence and compatibility with longer term UK climate change and energy goals and individual/community engagement.

15. The overarching objective underlying the RES is to tackle Climate change and improve the security of our energy supplies – it also has the potential to create significant employment opportunities in the UK renewable energy sector. The Stern Review made clear that, taking account of the full ranges of both impacts and possible outcomes and the assessment of the balance of risks, that the cost of inaction – in terms of loss of future GDP and welfare – is significantly more than the cost of abatement measures now. Furthermore, there is considerable uncertainty in the models used to estimate the damage costs of Climate Change, and Lord Stern has recently suggested that estimates of damage costs presented in the Review are likely to understate true damage costs by as much as 50%.

C. Costs and Benefits of options to achieve the UK renewables target

(i) **Do nothing option**. Under this scenario the UK would not meet its legally binding EU target of 15% renewable energy by 2020. This could result in monetary non-compliance fines from the ECJ. None of the benefits identified with meeting the target will apply – including carbon savings, innovation and business benefits.

(ii) **Measures to achieve the UK target**.

16. To assess the impact of the 2020 renewable target on the UK, we need to estimate the level of effort, in terms of output of renewable energy, needed to achieve a 15% UK share by 2020. Current estimates and future projections of UK Final Energy Consumption (FEC), on which the 2020 target is based, are given in Table 1 below. The table also illustrates how much renewable energy we would expect to achieve if we did not alter our policies to meet the EU renewable energy target – these are the

[3] http://www.theccc.org.uk/reports/

policies and measures underlying the Energy White Paper 2007 but not beyond. The costs of the RES are assessed on this baseline.

Table 1: Projected Final Energy and Renewable Energy Consumption in 2020

Sector	Projected Final Energy Consumption, 2020, TWh	Projected Renewable Energy, 2020 without RES measures TWh	Projected Renewable Energy 2020 with RES measures, (S1) TWh
Heat	599	5	72
Transport – EU Directive Definition	605	25	49
Electricity	386	57	117
Final Energy Consumption – EU Directive Definition	1590	87	239

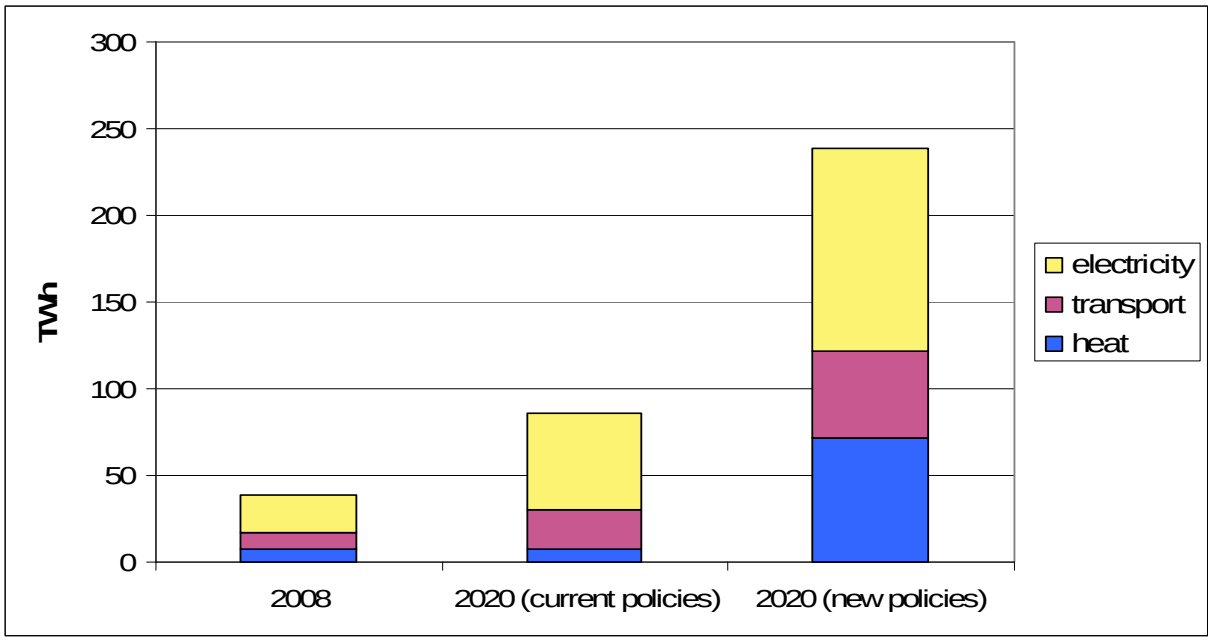
Note: The electricity sector includes electricity for heat and transport.

Figures are rounded to the nearest 1TWh, the target is 238.5TWh to nearest 0.5TWh.

17. The table shows the projected level of Final Energy Consumption, in line with the EU directive, of 1590 TWh in 2020 under central assumptions of fossil fuel prices and the impact of policy measures. These projections are uncertain, and in practice a number of factors can affect the forecast. A plausible range of uncertainty around this central case could be 1492 to 1695TWh which represents the 95% confidence interval around the central case. The central projection has been used as the basis for estimating the level of effort we need to make to achieve the target, but in practice there is uncertainty around this figure. It means that the measures set out in the Strategy will need to be flexible and evolve as our assessment of future energy consumption, and actual renewable deployment, evolve.

18. Table 1 shows that in order to meet a 15% renewable share, the UK would need nearly 239 TWh of renewable energy by 2020, with a range around this central estimates of 224-254 TWh, compared with 87TWh in 2020 of renewable energy projected under previous policies and measures and 39TWh in 2008. This will require around a seven-fold increase in the share of renewable energy in just 11 years. The policies set out in the Strategy aim to achieve this. Chart 1 illustrates the scale of the increase from current levels of renewable energy, and from our projected 2020 level of renewables based on measures in place at the time of the 2007 Energy White Paper but excluding the additional measures in the Strategy.

Chart 1: The size of the challenge - a potential scenario to reach 15% renewable energy by 2020



Source: Energy Trends June 2009 and DECC internal analysis

19. This level of increase can be applied across the different sectors in a number of ways. The scenarios presented in this IA are just a few illustrations of how this can be achieved. The estimates underpinning them are based on analysis and independent research of the level and cost of renewable energy that can be achieved under various assumptions. Table 2 shows the level of effort by sector needed to meet the 2020 target for the four scenarios presented here.

Table 2: Illustrative combinations of renewable energy by sector to achieve the 2020 target.

Sector	Scenario A		Scenario B		Scenario C		Scneario D	
	Ren Energy TWh	% ren energy by sector	Ren Energy TWh	% ren energy by sector	Ren Energy TWh	% ren energy by sector	Ren Energy TWh	% ren energy by sector
Heat	72	12%	52	8.5%	72	12%	72	12%
Transport	49	10%	49	10%	59	12%	40	8%
Electricity – large scale	111	29%	123	32%	92	24%	111	29%
Electricity – small scale	6	2%	11	3.5%	11	3.5%	6	2%
Severn Tidal Projects	-	-	3		3		-	-
Trading	-	-			-	-	10	-
Total	239	15%	238	15%	238	15%	239	15%

Note: Figures are rounded to nearest 1TWh. Totals may not sum exactly to 15% of the target due to rounding. Figures are not robust to this degree of rounding due to modelling uncertainty.

20. These scenarios are just possible descriptions of how the UK could meet its renewables target, and are not a precise representation of the future energy market. It will be necessary to maintain flexible policies and measures to adjust to actual market experience of renewable deployment. In summary, the scenarios are:

- **Scenario A**: Burden share of target 15% renewables in final energy. These sector shares represent what Government believes is the optimal balance of effort across the sectors, taking account of all the criteria in paragraph 14. All renewable deployment is produced domestically.
- **Scenario B**: This looks at the impact on other sectors if heat can only achieve 8.5% - independent consultants' central scenario for growth in this sector.
- **Scenario C**: This considers the impact of large scale electricity achieving only 24% renewable electricity, and transport increasing its share to 12%.
- **Scenario D**: This illustrates the impact of a lower transport share – 8% by energy. This illustrates the 10% biofuels target still being met, but with less than 10% by energy due to the different treatment of some biofulels in RES and the transport target. This scenario also illustrates the impact of trading – buying renewable energy from member states.

The Severn Tidal Power projects assumed in some of these scenarios are only illustrative of their potential contribution to the renewables target. They do not prejudice any future consultation on STP.

21. In assessing the relative strengths and weaknesses of various scenarios to meet the target, Government needed to balance several important factors as discussed in paragraph 14. On this basis, Government considered Scenario 1 as representing the best balance of effort across the sectors. Of the options that met the target entirely domestically, this had the lowest overall cost in 2020. Although Scenario 3 has lower overall costs to 2030, this option has 12% renewable energy from the transport sector, which carries a much higher risk of sustainability issues impacting on this sector than Scenario 1. In the large scale electricity sector, 29% renewable electricity represents balancing rapid roll out where risks are relatively well known and financial incentives are already in place, and higher penetration presenting greater risks to security of supply. In particular, greater intermittent wind generation can cause high and volatile peak prices. In the heat sector, analysis showed that 12% renewable energy represents a maximum that can be achieved in this time frame. Given that this is one of the most cost-effective sectors and that some stakeholders thought higher growth rates across some technologies were possible, the higher bound was chosen in the lead case. The small scale renewable electricity options are relatively expensive compared with other technologies and, as deployment is from a very low base, the scope for this sector to contribute a high level of effort is naturally limited. But Government recognises the importance of engaging communities and individuals in longer term climate change goals, which the development of small-scale electricity and heat can achieve, and to bring costs down longer term.

22. The lead scenario should not however be seen as a target for particular sectors / technologies. It is based on a range of assumptions about how industry growth rates can expand in the future, and on supply chain response rates. Because these are very difficult to predict, in practice it is very likely that the level of each renewable technology will evolve differently, and the final mix in 2020 will differ from that assumed. Given the uncertainties behind the trajectories, there is scope within the financial instruments to adjust and refine as the actual growth of renewable deployment emerges in response to incentives. Chapter 8 of the Strategy document explains how the Strategy will be reviewed over time, which will mean that the Government will be assessing progress on an ongoing basis.

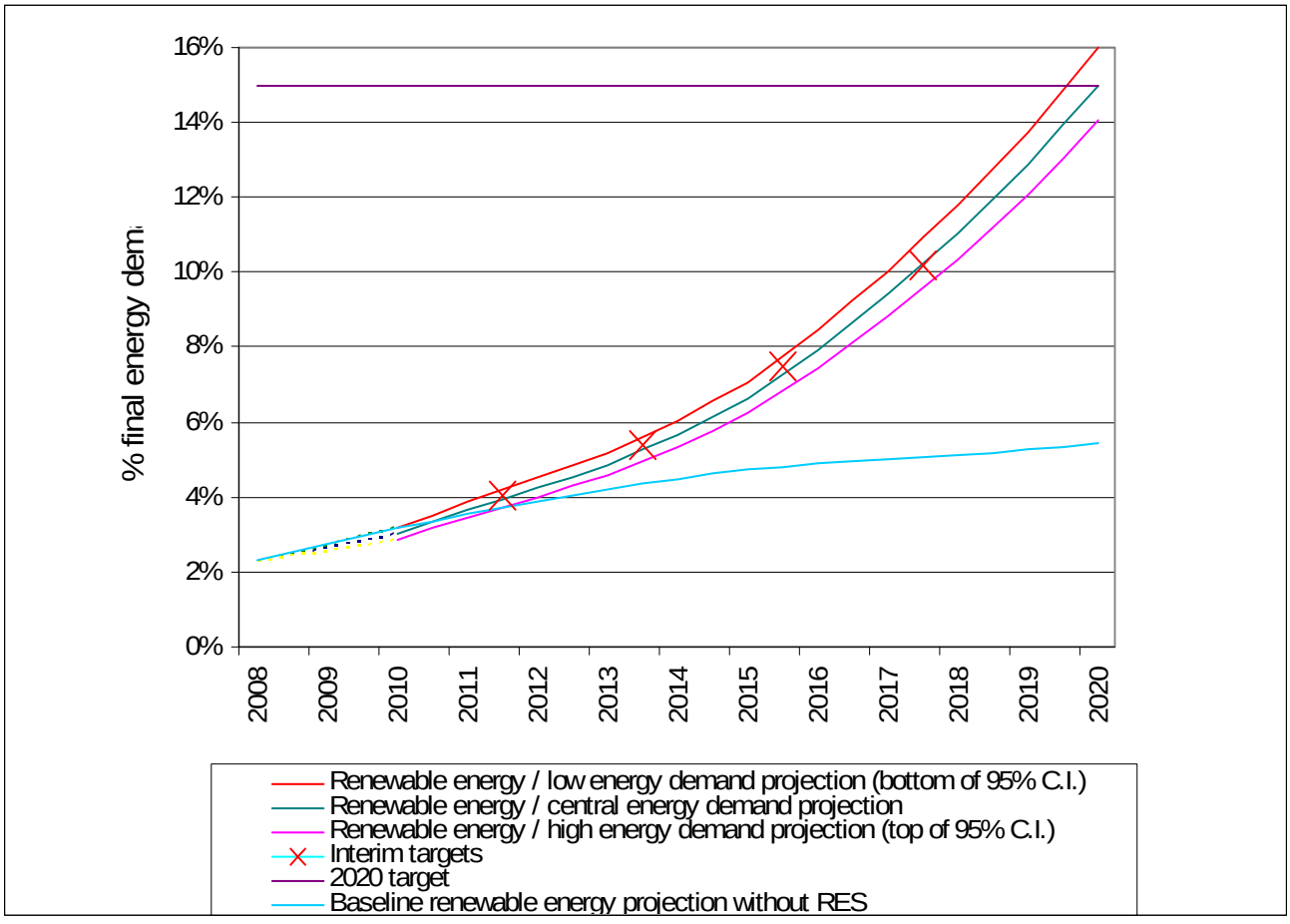
23. All the scenarios have been designed to illustrate different ways of reaching the 2020 renewables target of 15% renewable energy, but the indicative trajectory defined by the Commission (the interim targets) will be particularly challenging. The interim targets for the UK are:

- 4% renewable energy averaged over 2011-12
- 5.4% renewable energy averaged over 2013-14
- 7.5% renewable energy averaged over 2015-16
- 10.2% renewable energy averaged over 2017-18

24. If the UK does not meet this trajectory, it will have to resubmit its National Action Plan describing how it will return to the trajectory. This would involve a cost through diversion of government resources to this purpose, but a trajectory to be sure of meeting the interim targets would involve higher costs to the economy earlier on, and possibly lead to over-achievement of the 2020 renewables target, with associated costs and benefits.

25. The assessment of the trajectory of each of the scenarios, compared with the interim targets is shown in Chart 2. Because the interim targets are a percentage of final energy demand, and this is uncertain, the table gives a range of projections – low, medium and high – for projected energy demand. The analysis suggests that Scenarios A-C will meet the three interim targets (2011/12 to 2015/16) if energy demand is on the low side of projections. These scenarios meet the interim target in the central projection for the 2017/18 and 2020. Scenario D illustrates the possibility of using trading to hit all central projection targets. The RES sets out the principles under which Government will be open to trading.

Chart 2: RES lead scenario trajectory



Source: DECC internal analysis

26. The different levels of effort by sector were based on various consultancy projects in the individual sectors. For further details of these see the individual sectoral IAs. These studies looked at the potential for all technologies to deliver towards our target. For transport, the EU has a separate target of 10% renewable energy in surface transport, which can be achieved with different levels of renewables by energy due to the different treatment of biofuels. Sustainability criteria are still being addressed in this sector too. . All scenarios would require a step change for renewable energy and high and stretching build rates in electricity and heat. There are of course many more possible scenarios to reach the overall 15% share, and those chosen here are indicative only.

Summary of costs and benefits

27. Table 2 shows the resource costs and benefits related to each of the scenarios. Resource costs relate to the cost of the renewable technology over and above the cost of conventional generation. As well as technology costs, resource cost estimates include, where possible, the cost of overcoming barriers to higher renewable deployment, and in large scale electricity the cost of back-up generation, balancing and grid reinforcement costs. In the small scale electricity sector, costs relate to a household/community approach that aims to deliver more installations to this group, and a more diverse mix of technologies than could be achieved through a least cost approach only. Estimates reflect the cost of meeting the renewable target of 15% in 2020. Beyond this, there is no specific renewable target. However, the measures put in place to deliver renewables by 2020 will necessarily incentivise renewable deployment beyond this point, so costs and benefits will also accrue after this point, and are included in the longer term estimates.

28. The financial instruments needed to deliver the level of renewables in each of the sectors are still under development, including extending the Renewables Obligation. The precise details of how these will operate will affect the technology mix and therefore costs and benefits. Estimates should therefore be seen as a guide of the possible cost ranges going forward. Policy design options for individual sectors will be presented in further consultations and IAs.

29. Based on the estimates of renewable potential around the EU-27 developed by Pöyry (2008)[1], trading on a least cost basis with all European countries, renewable energy abroad could be purchased by the UK to count towards its target at £20/MWh. Renewable energy from France and Ireland only out of the EU-27 (directly connected projects only therefore), could be purchased at a significantly higher price. These trading costs are lower bounds, given they assume renewable energy abroad can be bought at cost. The savings from trading also depend on the domestic renewable energy generation it is assumed to replace. In our estimates in table 3 we have presented a range of cost estimates, using the £20/MWh as a lower bound estimate, and £55/MWh as the upper bound. The latter estimate was based on the estimated cost of 10TWh of French and Irish resource costs for renewables available after meeting their own targets.

30. There is a high degree of uncertainty on renewable energy potential around Europe in excess of the domestic targets for the Directive, and also on the costs of meeting the targets domestically in the UK. These potential cost savings are therefore purely

illustrative, and probably towards the upper end of the possible range since they do not take into account any costs of the trading mechanisms.

31. Using the RO to realise some of these potential resource cost savings would imply extra administrative costs falling to the exchequer. There is also a risk that opening up the possibility of trading will diminish investor confidence in renewables in the UK. However, this risk should be mitigated by the strong signal given to investment of a clear, credible long-term market for renewables by the Renewable Energy Strategy; and retaining the flexibility to use trading increases the UK's chances of hitting the challenging 2020 target.

32. The benefits in table 3 below are monetised benefits of carbon saved. These are valued at the carbon prices published in the Analytical Annex published with the RES. Ancillary benefits in the transport sector include air quality benefits, and other benefits of reduced congestion, reduction in accidents. All estimates have been discounted in line with Green Book guidance.

Table 3: Summary of estimated resource cost and carbon savings of renewable energy scenarios to 2020 Target.

£bn Discounted, 2008 prices. Central Fossil fuel price assumptions	In 2020 £bn	Cumulative to 2030 £bn
Scenario A		
Resource cost	£4.2	£60
Value of carbon saved	£0.4	£5
Net Benefit (no ancillary costs and benefits)	-£3.9	-£56
Net Benefit (incl ancillary costs and benefits	-£3.7	-£55
Scenario B		
Resource cost	£4.7	£69
Value of carbon saved	£0.3	£4
Net Benefit	-£4.4	-£66
Net Benefit (incl ancillary costs and benefits	-£4.4	-£65
Scenario C		
Resource cost	£4.3	£57
Value of carbon saved	£0.4	£6
Net Benefit	-£3.9	-£52
Net Benefit (incl ancillary costs and benefits	-£3.8	-£50
Scenario D		
Resource cost	£4.1 to 4.4	£57 to £59
Value of carbon saved	£0.3	£4
Net Benefit	- £3.8 to - £4.1	-£53 to -£55
Net Benefit (incl ancillary costs and benefits	-£3.8 to - £4.1	-£53 to -£55

Notes:

1. Estimates based on central fossil fuel prices. 2020 figures rounded to nearest £0.1bn, 2030 to nearest £1bn.

2. Costs associated with overcoming barriers to deployment of renewable electricity and with overcoming demand side barriers to renewable heat not included and totals could subsequently rise.

3. Resource costs take account of the carbon price in the traded sector. Negative numbers reflect net costs.

4. Ancillary impacts include air quality costs and benefits in the heat and transport sector, and other benefits in the transport sector such as reduced congestion, and accidents.

5. NPV in transport includes welfare costs not included in the resource costs, and the cost of CO2 incurred outside the UK.

6. The range of costs in scenario D reflect the range of costs from trading, as described in para 29.

D. Sensitivities

Given the uncertainty in the range of assumptions that underpin this analysis, sensitivity analysis on the key variables was undertaken in order to test the range of costs to variations in key assumptions. This analysis is presented below.

- ***Fossil Fuel prices***

33. The above estimates are based on DECC central fossil fuel price projections consistent with $80/bbl in 2020. In general the higher the prices of fossil fuels, the more attractive the renewable technologies become as the opportunity cost of using them falls. The impact of different fossil fuel prices have been examined using the DECC alternative fossil fuel price assumptions, corresponding with an oil price of $60 (low) and $150 (high high) per barrel of oil in 2020.

- ***Biomass prices***

34. The price and availability of biomass products significantly affects the cost and merit order of biomass technologies across the heat and electricity sectors. Future assumptions about biomass prices are therefore a key determinant of overall costs of RES. Central biomass prices were based on recent analysis[4] which constructed supply curves for UK biomass feedstocks under different scenarios of future national and global environmental policies. The analysis suggests that sustainable biomass could be available at relatively low prices in the future through domestic sources and plentiful import opportunities. However, there is a great deal of uncertainty around how the biomass market will develop in the future, and it could be the case that a competitive market emerges, with prices trending towards and moving with fossil fuel prices. Alternative (higher) biomass prices were therefore also modelled, full details of which can be found in the analytical annex.

- ***Biofuel prices***

35. Biofuel prices were created from outputs produced by the OECD-FAO Aglink-Cosimo model. There is uncertainty around how the global biofuel market will develop in the future, and is highly dependant on the level investment in supply and other countries consumption of the fuel. The future costs of the fuel are highly dependant on improvements in the technology and yield; both at the agricultural cultivation level and in the refineries. As with the biomass market, it could be the case that as a competitive market emerges, with prices trending towards and moving with fossil fuel prices. Alternative biofuel prices were therefore also modelled, full details of which can be found in the Transport IA.

- ***Carbon Price***

36. Carbon price assumptions affect the resource cost of the RES because they affect the cost of conventional generation – the higher the carbon price, the higher the cost of emissions associated with burning fossil fuels, and therefore the lower the premium associated with renewable technologies. The benefits in the traded sector (which are netted off resource costs in this sector) are reduced purchase of EUAs by UK firms, which reduce the compliance costs to UK firms, and are therefore valued at the EUA price. Carbon prices in the traded and non-traded sectors used throughout this

[4] E4tech (2009): 'Biomass Supply Curve for the UK'

analysis are as set out in the analytical note[5]. Since these assumptions were agreed, carbon prices have been updated and published in the IAG guidance (available at http://www.defra.gov.uk/environment/climatechange/uk/ukccp/pdf/greengas-policyevaluation.pdf). In order to test the sensitivity of costs to the new set of prices, we ran our models on the updated estimates, which are presented below. In the non-traded sector, the methodology for valuing carbon savings has moved from a social cost of carbon approach to valuing carbon reductions according to the cost of meeting longer term emissions reductions targets. This latter approach has increased the non-traded price considerably, particularly post 2020.

- ***Discount Rates***

37. Various discount rates have been used in the cost-benefit analysis to take account of the cost of individuals' and firms' cost of capital and rate of time preference. For the large scale electricity sector, these depend on investor type and reflect different companies access to capital. Details of the rates used in this sector can be found in Redpoint et al (2009). For individuals in the heat and small scale electricity sectors, there is a distinction between the 'economic' discount rate - that is, the rate underlying the resource cost of using renewable technologies and the 'hurdle' rate – the rate that individuals demand to invest in these technologies. Individuals' hurdle rates are difficult to ascertain because they depend on a wider range of factors, including how different groups value consumption over time; the perceived risk and benefits of the technologies; as well as individual preferences. To reflect the observation that different groups face different discount rates, and that individuals' economic decisions based on energy technologies are often high, analysis for RES tested the sensitivity of different discount rates. These rates are used to determine the future stream of costs and benefits of deploying renewables. To convert these to present value terms, the standard 3.5% social discount rate is used, in line with Green Book methodology. Further detail of the impact of using different discount rates are shown in the Heat and Small Scale Electricity Impact Assessments.

38. The impact of these sensitivities is shown in Table 4 below.

[5] DECC (2009): 'The UK Renewable Energy Strategy 2009: An Analytical Annex'

Table 4: Impact of Cost of Scenario A with alternative assumptions

£bn Discounted, 2008 prices. Central Fossil fuel price assumptions	In 2020 £bn	Cumulative to 2030 £bn
Central Fossil Fuel Prices		
Resource cost	£4.2	£60
Value of carbon saved	£0.4	£5
Net Benefit	-£3.9	-£56
Low Fossil Fuel Prices		
Resource cost	£6.6	£99
Value of carbon saved	£0.4	£5
Net Benefit	-£6.3	-£95
High Fossil Fuel Prices		
Resource cost	£1.0	£16
Value of carbon saved	£0.4	£6
Net Benefit	-£0.7	-£12
Updated Carbon Prices		
Resource cost	£4.4	£57
Value of carbon saved	£0.6	£8
Net Benefit	-£3.8	-£50
High Biomass Prices		
Resource cost	£4.6	£65
Value of carbon saved	£0.4	£5
Net Benefit	-£4.2	-£60
Low Discount Rate		
Resource cost	£3.9	£57
Value of carbon saved	£0.4	£5
Net Benefit	-£3.6	-£52
High Discount Rate		
Resource cost	£4.5	£64
Value of carbon saved	£0.4	£5
Net Benefit	-£4.2	-£60

Notes: Alternative biomass prices only modelled in Heat and Small scale electricity sector. See Transport IA for alternative biofuel price impacts.

Low discount rate assumes a 10% discount rate used to calculate resource costs in heat and small scale electricity, and high discount rate 16%.

Net benefit includes ancillary impacts, welfare costs, and cost of non UK carbon in the transport sector, not included in the resource cost.

High fossil fuel sensitivity results in lower additional deployment from small scale electricity, due to a greater overlap with RO supported renewable electricity.

Cost Effectiveness

39. Cost effectiveness indicators provides an estimate of the net social cost per tonne of GHG reduction from the policies set out in the Strategy, of those costs and benefits that are quantifiable. The overall cost effectiveness indicator for RES is defined as:

Cost effectiveness of carbon saved in the traded sector	(PV all costs – PV benefits (excluding PV of carbon saved in the traded sector) / carbon saved in the traded sector
Cost effectiveness of carbon saved in the non-traded sector	= (PV all costs – PV benefits (excluding PV of carbon saved in the non-traded sector)) / carbon saved in the non-traded sector

The resulting cost-effectiveness figures are compared with the weighted average carbon price for the traded and non-traded sectors respectively. These are shown for the RES sectors in Table 5 below.

Table 5: Cost-effectiveness indicators for RES

Sector	Cost – effectiveness £/tCO2	Weighted average EUA or non-traded price £/ C02
Cost effectiveness of non traded carbon for the RHI (with ancillary costs)	£80 (£88)	£39
Cost effectiveness of traded carbon for the RHI (with ancillary costs)	£78 (£88)	£21
Cost effectiveness of non traded carbon for the transport sector (with ancillary benefits)	£87 (£65)	£35
Cost effectiveness of traded carbon in the transport sector (with ancillary benefits)	£348 (£205)	£21
Cost effectiveness of traded carbon - large scale electricity	£105	£21
Cost effectiveness of traded carbon - small scale electricity	£270	£25

Note: Estimates based on traded and non-traded carbon price at 2008 prices.

The estimates show that none of the emissions reductions in the RES are below the EUA/non-traded price of carbon. However these indicators can only include those factors that are quantifiable. There are other benefits of the RES which are not included in the above such as improving security of supply and diversifying the energy mix, that are important considerations. As stated in the rationale, investment now will reduce costs longer term and put the economy on a transition to a low carbon economy – needed to avoid the higher costs of inaction.

Impacts

Impact on Greenhouse Gas Emission Reductions

40. The greenhouse gas (GHG) emission reductions from achieving 15% renewable target in the UK will depend on what types of technologies are deployed in order to meet the target, some of which will be in the traded sector and others in the non-traded sector. The GHG emission reductions in the traded sector will be determined by the overall cap on emissions (relative to what emissions would have been in the absence of the cap) and while the deployment of renewables in the traded sector will help towards the meeting of the cap, it will not result in *additional* GHG emission reductions in the traded sector above that implied by the cap. It will, however, lead to benefits to the UK in terms of avoided abated costs elsewhere in the traded sector, or avoided purchase/increased selling of EU Emissions Trading Scheme allowances (EUAs). This benefit is valued at the projected EU-ETS carbon price and netted off within the resource costs.

41. Estimating the GHG emission reductions that are likely to result from achieving 15% renewables target in the UK therefore requires an assessment of which types of renewable energy technologies will be deployed and the conventional energy sources that they will be replacing. Based on the current structure of the EU ETS, large and small scale renewable electricity will replace conventional generation within the traded sector and that transport biofuels will replace conventional fuel in the non-traded sector. The picture for renewable heat is, however, more complicated as it could be deployed through technologies such as industrial biomass heating, which is primarily in the traded sector, or through technologies such as biomass heating in the domestic or service sectors which is primarily in the non-traded sector. Table 6 shows the estimated carbon savings in these sectors.

Table 6: Estimated carbon savings from the Scenarios

	Carbon saving in 2020 MtC02	**Cumulative carbon saving to 2030 MtCO2**
Scenario A:		
Traded	35	535
Non-traded	15	220
Total	50	755
Scenario B:		
Traded	45	690
Non-traded	15	170
Total	55	860
Scenario C:		
Traded	30	400

Non-traded	20	260
Total	50	660
Scenario D:		
Traded	35	530
Non-traded	15	190
Total	50	720

Note: Estimates rounded to nearest 5MtC02. Figures may not sum due to rounding.

Impact of the Renewables Target on the EU Emissions Trading Scheme

42. There are interactions between the EU ETS and the renewables target in that the ETS should bring on the cheapest abatement options while the renewables target requires that Member States invest in renewable energy, which could potentially be more expensive. To the extent that the level of support for renewables would exceed the carbon price that is required to meet the 20% GHG target, it can be expected that investment in new renewable electricity (and some renewable heat) would displace lower-cost emissions reductions through the ETS. This will result in a lower carbon price (relative to a scenario where there is no renewables target) and higher overall costs of meeting a given GHG reduction target.

43. Assuming that most renewable heat and electricity will require an incentive in excess of what is likely to be provided by the carbon price in Phase III of EU ETS, the impact of the renewables target on the carbon price will be determined by the magnitude of the abatement from meeting the target (relative to the total abatement effort that is required from EU ETS). A more ambitious renewables target will, all things being equal, result in a larger fall in the carbon price.

44. Internal DECC analysis suggests there will be a significant amount of effort for the EU ETS to undertake after accounting for the abatement that will result from meeting the renewables target. This will result in the carbon price being lower than otherwise (relative to a scenario where there is no target to increase the deployment of renewable energy). These impacts are set out in the IA of the EU Climate Change and Energy Package[6]. It is also important to note that the figures presented above relate to the EU meeting a 20% GHG target. In the event of an international agreement, a 30% GHG target would apply and the ETS cap is likely to be tightened considerably. Under this scenario we would expect that meeting the renewables target would place less downward pressure on the carbon price. Increasing the scope of the EU ETS to include emissions from aviation is likely to have a similar effect. Given the central importance of the EU ETS to our strategy, we shall continue to analyse the potential impact on its operation of the renewables target.

Impact on Security of Supply

45. RES will impact on UK energy security of supply through all energy sectors – electricity, heat and transport. A higher level of renewable energy in the energy mix should have a positive impact on geo-political security of supply in the UK. DECC analysis suggests the renewable energy target could reduce UK consumption of fossil fuels by around 10% in 2020, and imply a 20 to30% reduction in gas imports by that time.

[6] http://decc.gov.uk/en/content/cms/what_we_do/lc_uk/carbon_budgets/carbon_budgets.aspx

46. Increasing renewable electricity to over 30% creates some specific challenges for electricity security of supply because the renewable sources produce variable and intermittent output, which requires back-up from conventional plant. This is discussed further in the large and small scale electricity IAs.

47. The security of supply from bio-thermal applications in heat and electricity will depend on the security of supply of input fuel. Analysis for RES by E4Tech[7] suggests that there could be sufficient biomass resource potential in the UK to meet this demand in 2020 and the import market for biomass will grow as biomass increasingly becomes a traded commodity. Overall, these factors are likely to have positive security of supply implications for the UK, through:

- Reducing reliance on imported oil and gas, towards locally produced or imported biomass feedstocks. This will tend to reduce the geopolitical risk associated with the former.

- Developing sustainable global biomass supply chains could help biomass to become a fundamental part of the UK energy mix and one which can be employed in a flexible manner. Greater diversity and flexibility of electricity and heat sources can help to make the system more resilient and able to respond to shocks or price spikes.

48. But the biomass market in the UK is in its infancy and it will be important to monitor the development of the supply and prices, and to provide a framework to remove any non-financial barriers to a competitive market. Measures to assist the development of this market are detailed below.

49. In the heat sector, solar thermal installations reduce the risk (to their own consumers) of supply disruption due to fuel or transmission system failures, while heat pumps reduce consumers' exposure to fossil fuel price fluctuation. In terms of the security of supply of energy for the UK as a whole, greater use of renewable sources for heat generation should reduce overall demand for fossil fuels, by approximately 68TWh in 2020 (33 TWh of heating oil, 30TWh of natural gas and 5TWh of solid fuels such as coal).

50. In the transport sector, biofuels can contribute to energy security by diversifying and increasing the number of supply sources and routes for transport energy. Increasing the proportion of biofuels in retail fuels also decreases the amount of petroleum product or crude oil imports needed to satisfy domestic demand, though biofuels will under this strategy still only constitute one tenth of total road and rail fuel consumption. Overall we assess that biofuels could to a certain extent positively impact the UK's security of supply.

Impact on energy prices

51. Policies to increase renewable energy deployment will add to energy prices and bills. Aside from the increase in deployment, this will be one of the major impacts of the policies set out in the Strategy. The impact on consumer prices and bills will depend on the subsidy costs of the financial instruments – the RO, RHI, FITs and the RTFO - designed to incentivise deployment, and on the extent these costs are passed through to final consumers.

[7] E4Tech (2009): 'Biomass Supply Curve for the UK'

52. The estimated impact on prices and bills will also depend on how the costs of other components of energy prices change, particularly underlying fossil fuel prices. Bills do not necessarily need to rise as much as prices – using less energy, and installing energy efficiency measures can help mitigate these effects, as will deployment of the renewable technologies among households and communities. Table 7 below summarises expected impact on electricity bills, assuming fossil fuel prices consistent with $80bbl in 2020. In this case the average increase in domestic electricity bills is estimated to be around £75 in 2020, and around £56 for the period 2011 to 2030, relative to what they would otherwise have been.

Table 7: Estimated impact on annual domestic electricity prices and bills resulting from Scenario A

2009 prices	**Central Fossil Fuel prices**		**Upper bound fossil fuel prices**	
	Average bill impact	% Impact	Average bill impact	% Impact
2015	£12	2%	£7	1%
2020	£77	15%	£17	2%
2011-2030	£58	11%	£13	2%

53. The table shows that the biggest impact on prices and bills will be in 2020 and beyond as the level of renewable generation increases to 2020. Price and bill impacts depend crucially on the level of fossil fuel prices assumed. The central estimates above are consistent with an oil price of $80 per barrel in 2020, and the upper bound estimates with $150 a barrel. Under the upper fossil fuel price assumptions, the percentage increase in electricity bills is around one-fifth that of central case assumptions.

54. The cost of measures to incentivise the uptake of renewable heat will be met by a levy on the suppliers of fossil fuels which are used for heating. These subsidy costs are expected to be passed onto fossil fuel customers through price increases, thus impacting fossil fuel heating bills. The precise scale of such impacts will depend on the scale of renewable heat options, their costs, and how well targeted a financial incentive in the heat sector could be made to operate in practice. Estimates of the projected impact on gas bills in a scenario where we deliver 12% renewable heat are shown in Table 8 below. This assumes that the full costs of the RHI are felt on gas bills. The average increase in domestic gas bills under central fossil fuel prices is estimated to be around £172 in 2020, and around £111 for the period 2011 to 2030, compared with what they would otherwise have been.

Table 8: Estimated impact on annual domestic gas prices and bills resulting from Scenario A

	Central Fossil Fuel prices		Upper bound fossil fuel prices	
	Average bill impact	% Impact	Average bill impact	% Impact
2015	£34	5%	£32	3%
2020	£172	23%	£165	16%
2011-2030	£111	15%	£106	10%

Note: Price impacts are shown at 2009 prices, undiscounted

55. The table shows that under higher fossil fuel price assumptions the impact of these measures on prices and bills will reduce as the cost of conventional heating technologies increases. Under a scenario consistent with $150/bbl, the percentage increase in bills would be reduced by around a third. The impact of higher fossil fuel prices in this case are less pronounced because, although average technology costs reduce, marginal costs (on which subsidy levels are based) do not fall as much.

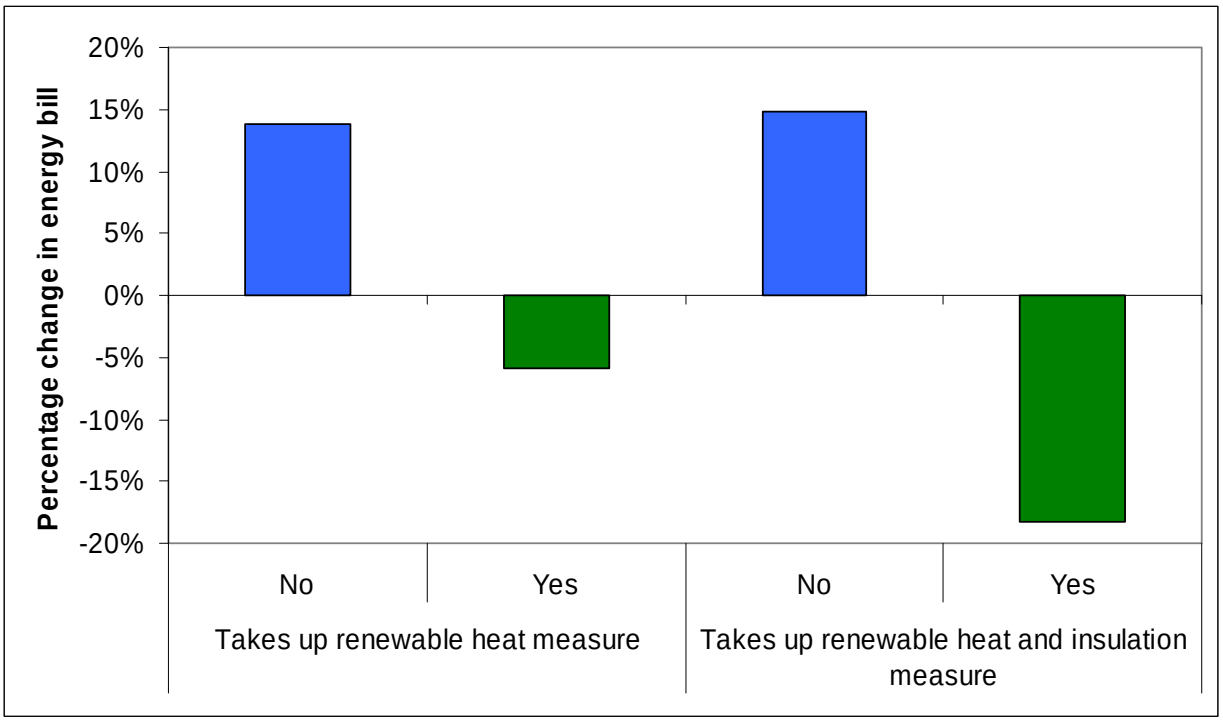
Distributional Impacts

56. The policy measures described here could have an impact on vulnerable groups such as the fuel poor due to the price and bill increases described above. The distributional impacts will depend on a number of factors such as which groups take up the small scale renewable technologies; how much households spend on energy; overall energy consumption, including the impact that energy efficiency measures and higher prices have on reducing household energy demand. In addition, there is some uncertainty as to how the cost of the FITs and RHI in particular will feed through to different tariff structures from energy companies.

57. The average increase in bills does not give a complete picture of the impact on different types of household – according to both their income and whether they take up a renewable heat or electricity technology. Higher income households consume more energy and have higher energy bills so will see a larger absolute bill increase. But poorer households are likely to spend a higher proportion of their income on energy and so increases in bills will impact more on them. DECC are undertaking a review of Fuel Poverty to consider whether our existing policies can be made more effective and whether new policies should be introduced to help us make further progress towards our goals

58. Another significant difference is between households that take-up a renewable technology and those that don't. Analyses undertaken by DECC shows that households that receive measures face much lower increases in their bills, and that the difference between high and lower income households is much smaller, and could fall. Chart 2 below illustrates this for the RHI measures and for RHI with insulation measures. Further details of this can be found in the Analytical Annex to the UK Low Carbon Transition Plan (http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.asp) Further work on the distributional impacts will be considered in the later consultations on the RHI and FITs, alongside the review of Fuel Poverty.

Chart 3: Percentage change in energy bills for households that take up renewable heat and insulation measures, 2020



Impact on business

59. RES will create large business and job opportunities. In the RES consultation, it was estimated that 160,000 jobs could be associated with UK renewable energy generation in 2020, with these jobs accruing in the UK and abroad.

60. Since the consultation, Innovas have produced a report for BERR[8], which suggested that the size of the renewable energy sector, and of the broader low carbon and environmental goods and services economy, has been substantially underestimated up to now.[9] Innovas estimated that in 2007/08, the UK renewable energy sector was worth £31.1bn and employed 257,000 people including the supply chain. Taking a broader definition of renewables, including biofuels, increases the 2007/08 estimate to around 390,000.[10]

61. Based on Innovas projections and Labour Force Survey data, the effect of the RES (combined with growing renewable energy markets across Europe and globally) would be to increase UK employment in the renewable energy sector by up to 540,000 people by 2020/21 [to reach up to 920,000 in total]. These projections use

[8] Innovas, 2009, *Low Carbon and Environmental Goods and Services: an industry analysis*

[9] Their bottom-up methodology reveals more low carbon and environmental activity than SIC coding, and other previous estimates. However, it risks double counting companies who produce goods or services for more than one environmental market. Innovas compare their numbers to validated and verified data sources to mitigate this risk.

[10] This broader definition of the renewable energy sector includes, in addition to the Innovas renewable energy sector: heat pumps R&D, solar heating, and biofuels from Innovas data, plus a Labour Force Survey-based estimate of 2020 direct employment in renewable power generation. These people work for UK and export markets, and so the Innovas numbers are not strictly comparable to the 160,000 estimate of jobs associated with the RES in the UK and abroad.

the broader definition of the sector and are of course subject to considerable uncertainty.

62. More recently still, the *Employ RES* report for the European Commission has estimated the 2020 total EU-27 employment in renewable energy sectors will be around 2.8 million. The estimates from different studies vary as a result of different definitions, but also because of the degree of uncertainty involved in future projections. The net impact on employment of the RES is likely to be roughly neutral. Modelling for the European Commission[11] suggests overall the RES may slightly increase or slightly decrease UK employment in 2020 depending on the model used.

63. The RES will also have some negative impacts on business, especially in energy-intensive sectors, due to increased energy prices, driving up costs and reducing competitiveness. These effects are explored in the wider economic impacts section below.

Wider Economic Impacts

64. The estimated costs shown in this IA are the direct costs of deploying renewable technologies in place of the conventional alternatives. The impact on the wider economy needs to take account of higher prices feeding through to all energy users, and how this impacts on their outputs, and of the large stimulus to investment that underlies the RES.

65. RES will increase the level of investment in the renewable energy sector, and reduce it in the conventional energy sectors, but the overall level of energy investment will increase, because renewable energy is currently more expensive than conventional alternatives. In the short to medium term, there is likely to be a higher overall level of investment in the economy, leading to a boost to overall output.

66. The RES will also increase energy prices. As set out in Tables 9 and 10 below, in 2020 non-domestic electricity bills are estimated to rise by 15% and 30% for gas bills, compared with no RES. The tables show that, just as for domestic bills, a sustained higher fossil fuel prices reduce the estimated impact of the RES on non-domestic bills.

Table 9: Estimated impact on annual non-domestic electricity prices and bills resulting from Scenario A

	Central Fossil Fuel prices	**Upper bound fossil fuel prices**
	% impact	% Impact
2015	2%	1%
2020	15%	2%
2011-2030	10%	2%

[11] Franhofer Institute et al, for the European Commission, 2009, *Employ RES – The impact of renewable energy policy on economic growth and employment in the European Union*

Table 10 : Estimated impact on annual domestic gas prices and bills resulting from Scenario A[12]

	Central Fossil Fuel prices	Upper bound fossil fuel prices
	% Impact	% Impact
2015	6%	4%
2020	30%	18%
2011-2030	19%	12%

Note: Price impacts are shown at 2009 prices, undiscounted

67. Higher energy prices will lead domestic consumers to reduce or substitute away from energy consumption to a small degree, due to the relatively low elasticity of demand for energy consumption. Business could react by reducing the energy-intensity of their production, reducing their overall output, increase prices of non-energy goods and/or reduce their margins. Higher prices and costs will tend to reduce the overall level of consumption and incentives to invest outside the renewable energy sector. It will also lead to a loss of competitiveness of UK firms, which could impact by reducing exports. Overall the impact of higher prices and costs will be to reduce output.

68. HMRC undertook macro-economic modelling of the RES measures. The results suggest that the positive effects described above could roughly balance the negative effects described above. The results are summarised in Table 9 below. Compared with the baseline of Energy White Paper 2007 policies, a scenario with the EU Emissions Trading Scheme as negotiated in the recent ETS Directive, but excluding the RES, reduced GDP by around 0.5% in 2020. The scenarios with the ETS and RES reduced GDP by roughly the same amount - 0.5 to -0.6%. In the longer term, the impact of RES was to reduce GDP compared with ETS measures alone, although the difference was not significant.

Table 11 GDP impacts of different scenarios relative to an Energy White Paper baseline

	2020	2030[13]
ETS only	-0.5%	-0.1%
ETS & RES	-0.5 to -0.6%	-0.1 to -0.2%

69. Macroeconomic modelling for the European Commission on the effect of renewable energy policies to achieve the 2020 renewable target across Europe, suggests that for EU-27 as a whole, in 2020 the positive effects will outweigh the negative effects, and European GDP will be boosted by 0.23 to 0.25% in 2020 (under their medium exports scenario). However, for the UK they find that GDP effect is smaller – around 0.1% in 2020 under their Astra model - or even marginally negative under their Nemesis model.

[12] There is a wide range of energy use by firms in this sector and the average bill impact will depend on individual firms' energy use.

[13] The GDP impacts relative to the baseline are much lower for all scenarios in 2030, because of an adjustment effect whereby abatement technology becomes significantly cheaper and as the carbon markets are assumed to become global, caps are estimated to be looser during the early years to aid implementation. Therefore it is better to look at the relative ordering in each year rather than comparing the size of the effects between years.

70. These small projected changes in GDP should be viewed in context of the much larger potential costs of inaction on climate change. The Stern Review suggested that global action to tackle climate change will avoid global costs equivalent to 5-20% of global GDP per annum and dwarfing the costs of coordinated international action (around 1% of GDP by 2050). These cost estimates have been largely confirmed by Government modelling, which suggests that costs of action will vary between 1-3% of global GDP in 2050.

Impact on Devolved Administrations

71. The UK Renewable Energy Strategy will impact all energy consumers in the UK and depending on where investment in renewable energy projects actually occurs, will have different impacts across geographical regions. For example, any potential decision on developing tidal power projects in the river Severn would be an example of a major project with particular regional implications. Most onshore wind generation potential is in Scotland. Some of the key policy levers to deliver the target are devolved - for example, the Scottish Executive has responsibility for planning decisions for Scotland; and the implementation of Energy Bill powers relating to the Renewables Obligation are devolved to Scotland and Northern Ireland. The Devolved Administrations are therefore, conducting their own work on the renewables target. We will be heavily dependent on contributions from each of the DAs in order to meet the UK target.

72. In Scotland, the Scottish Executive has published a Renewables Action Plan for Scotland, following consultation in late 2008 on meeting a 20% renewable energy target by 2020. In Wales, the Welsh Assembly Government published a Renewable Energy Route Map last year. The Energy Strategy for Wales is currently being drafted. In Northern Ireland, DETI is developing a revised Strategic Energy Framework for Northern Ireland to move the existing 2004 strategy forward towards 2020. It is planned to issue for consultation in spring with sustainability of the energy system at its core.

Risks

73. There are a number of risks that the policies set out in the Strategy might not deliver the amount of renewable energy required to reach 15% of overall energy use by 2020. These include the risk that it will not be possible to implement policies in time to have the desired effect; that policies will not prove sufficient to overcome the barriers; that the response from the investment community and individuals will not be sufficient to meet the targets; that costs will turn out to be greater than we have identified; and the risk that other constraints, supply side barriers, or unidentified impacts will emerge. There is also a risk is the final energy consumption is higher than forecast so that we need more renewable energy (in absolute numbers) to meet our renewable energy target of 15%. The three sectoral IAs set out the risks to each sector in particular.

74. We will seek to mitigate these risks by reviewing the outcome of policies and progress towards the target in the National Action Plan to be submitted to the Commission by June 2010.

75. There is also a risk that the wider environmental impacts of building renewable energy infrastructure and using bioenergy, particularly biofuels, will prove unsustainable. We will seek to ensure this does not happen, by for example, our policies to ensure that we maintain air quality standards and our policies on

environmental permitting. With regards to biofuels, the Commission will review aspects of the transport targets by the end of 2014, including cost-efficiency, the feasibility of reaching the 10% target whilst ensuring the sustainability of biofuels and a review of the minimum greenhouse gas savings thresholds, taking into account the availability of first and second generation biofuels.

Implementation

76. The UK has a legal obligation to transpose the EU Renewable Energy Directive into UK law 18 months after the Directive was published in the Official Journal – that is by December 2010. The Directive also sets out that the UK must submit a National Action Plan to the EU Commission by June 2010 setting out how we intend to achieve our share of the overall renewable energy target (15%), including the possible split between sectors and how the UK intends to achieve the interim targets to 2020.

77. The wide ranging nature of the policies required to achieve 15% renewable energy is reflected in the various approaches to implementation. In some cases the UK has already taken legal powers to implement the policies suggested in the Renewable Energy Strategy Consultation including Feed-in-tariffs for small scale electricity generation and the Renewable Heat Incentive in the 2008 Energy Act.

78. However, there may be the need for further legislation should we decide, for example, to introduce a mechanism aimed at stabilising the revenue renewable electricity generators receive. We will also require secondary legislation to amend the Renewables Obligation to support projects where renewable electricity is generated outside the UK but consumed in the UK. Further legislation would be required to if we wanted to use other forms of joint projects. Other policies may also require legislation.

79. On transport the Department for Transport will hold a consultation on detailed proposals for examining the scope for amending the existing renewable transport fuel obligation later in 2009, allowing changes to come into force towards the end of 2010.

ANALYSIS OF POLICIES

80. The Strategy sets out the policy framework we consider necessary to deliver the UK renewable energy target – this necessarily includes a wide variety of policies across the three energy sectors. More information on particular instruments or policies related to particular sectors can be found in individual sector impact assessments, or impact assessments published with related consultation documents. The discussion below sets out costs and benefits for new policies which apply to more than one sector, and that have not already been consulted on elsewhere. In other cases, where the policy detail has yet to be decided, the paragraphs below point to future consultations.

81. Policies to support renewable transport are dealt with in the transport IA (such as biofuels and the Renewable Transport Fuel Obligation) and policies that relate to the *UK Low Carbon Transition Plan* can be found in the accompanying Impact Assessment.

82. The baseline scenario, which is used as a counterfactual to all scenarios, is based on the policies which formed the basis of the 2007 Energy White Paper.

SWIFTER DELIVERY: Policies on planning, supply chain barriers, regional targets and Bioenergy

Planning barriers: summary of costs and benefits of measures

83. The policies to address planning barriers to renewable electricity are:

Table 12: List of measures to address planning constraints

a. Development and implementation of National Policy Statements (NPS)
b. Strategic approach to planning in the marine environment through establishment of the Marine Management Organisation.
c. Regional strategies to establish targets for the deployment of renewables
d. Evidence based approach to objectively and consistently assess the potential for renewables deployment.
e. Provision of advice and support to the planning community
f. Establishment of performance indicators for Local Authorities to assess progress on the deployment of renewables
g. Improvements to the way in which the TCPA system works
h. Implementation of the Aviation Action Plan

84. The likely costs of these measures would be:

- These measures would involve resource costs to Government. Measure c would involve resource costs for RDAs and/or LAs. Measures a,b,c,d and e will have resource cost implications for the Department for Energy and Climate Change. Measure g will have resource cost implications for the Department for Communities and Local Government as part of its review of recommendations from the Killian Pretty Review.
- Measure h involves voluntary contribution by business to fund the programme of work. None of the other measures would involve direct costs on business.

85. The likely benefits from these measures would be:

- These are enabling measures – to remove barriers to renewable development.

Supply chain barriers: summary of costs and benefits of measures

86. We are **launching the Office for Renewable Energy Deployment**, which will form part of DECC. The Office will help address renewables deployment issues, in particular planning issues and supply chain. The ORED will address delivery issues across a range of deployable renewable energy technologies and help to develop UK manufacturing, skills and jobs to address bottlenecks. It will take forward a number of measures to support an effective and proactive planning regime at local and regional level. It will therefore drive delivery and clear away barriers to increased renewables deployment. The benefits will be increased deployment and increased benefits to UK business from the Renewable Energy target.

87. In addition, the policies considered in this strategy to address supply chain barriers are:

Table 13: List of measures to address supply chain constraints

a. Strengthen UK supply chain and attract inward investment through providing support to infrastructure development in UK ports to enable offshore wind development.
b. Facilitate and promote active engagement and dialogue with the

finance and investment community.
c. Strengthen the UK Inward Investment Service (and trade promotion) to attract investment in to the renewable supply chain, ensuring the UK manufacturing sector and components suppliers can make the most of new opportunities.
d. Proactive Supplier Development activity to enable businesses to gain entry to the UK's renewable energy supply chain.
e. Expand the capital grant scheme for offshore wind demonstration
f. Development of a national offshore wind test centre to enable significant sector development

88. The likely costs of these measures would be:

- Ports: would involve a cost to the public sector in ensuring local infrastructure is suitable for offshore wind development. There are no increased costs to businesses.
- Skills Strategy: There would a financial cost to government in developing training solutions and qualifications. Costs to businesses would be an implied cost in terms of time and commitment of workforce.
- Inward Investment Service: This could involve additional pressure on existing public sector resources, or additional resources. There would be different options as to how far this could be taken.
- Supplier Development: There would be a financial cost to government and match funders (e.g. RDAs etc.). There may also be a cost to those businesses who wish to take up this opportunity as it is a subsidised service rather than free.
- Capital Grant scheme for offshore wind: There would be a financial cost to government in providing a 25% Government funded subsidy. There would be a cost to those businesses who wish to take up this opportunity.
- National Offshore Wind test centre: There would be a significant cost to the public sector in developing such a centre.

89. The likely benefits from these measures would be:

- Ports: would provide benefits to businesses in assisting readiness of ports and for companies wishing to invest in them to support the UK's ambitious offshore sector.
- Inward Investment Service: would present opportunity for significant improvement in facilitating and promoting active engagement and dialogue with the finance and investment communities. It would provide access to a source of knowledge on the renewables sector.
- Supplier Development: would provide a subsidised service of helping business in entering the UK renewable energy supply chain.
- Expanded Capital Grant Scheme: would provide a contribution to those businesses who participate and has additional benefit of providing significant technology development in offshore wind.
- National Offshore Wind test centre: would provide potentially very large benefits in sector development by providing the facility. Also a major benefit in attracting inward investment

90. All of these measures are enablers and help to remove barriers to deployment.

Policy on Skills: summary of costs and benefits of measures

91. The switch to renewable energy will require the UK to develop a suitably skilled workforce – without which we will not be able to install, build and maintain the necessary infrastructure. Research has identified constraints on availability of engineers, installers and designers as a major barrier to faster renewable deployment. There is a lead time associated with training skilled workers that means the UK needs to develop a strategy now. Added to this, the energy sector in general has an aging workforce and retirement will take an increasing toll.

92. Work on ensuring the UK has the right skills to develop renewable energy is being taken forward by EU Skills (the SSC responsible for identifying skills needs in the gas, power, waste management and water industries) in collaboration with other SSCs. Industry are also involved e.g. the electricity sector are working with EU Skills in developing the National Skills Academy for Power, which will provide focus and leadership for skills in the networks and will support some 69,000 learners in its first three years of operation. During this timescale the Academy will also receive capital and revenue funding from BIS with matched funding from employers in the sector. Policies set out in the RES include:

Table 14: List of measures to address skills for the renewable energy industry

g. Development of a Renewable Energy Skills Strategy to improve research and develop qualifications and training that is matched to employers' and the energy sectors needs

93. This will provide significant benefits through having a co-ordinated strategy to help ensure the renewables energy sector has the skilled workforce that it needs.

94. Some specific work on training in the bio-energy sector has been taken forward at regional levels, while the Biomass Energy Centre has developed, in partnership with key industry associations, updated information and guidance aimed at improving awareness amongst architects and building services engineers.

National, Regional and Local Targets: Summary of Costs and benefits of measures

95. The Devolved Administrations will undertake an evidence-gathering exercise to assess renewable electricity and heat potential, and propose a level of ambition for renewable energy delivery by 2020. In England, the RDAs and Local Authorities will follow a similar approach to identify renewable energy potential and set their own targets as part of their Regional Strategies.

96. This approach will enable a more evidence-based approach to renewables planning. The English regions already have renewable energy targets as required under PPS1 supplement on climate change and PPS22 on renewable energy, but these are not always based on a evidence-based assessment of opportunities and constraints and were set prior to agreement of the new EU target, as a result they are not in line with UK-level ambitions and will need to be revised in light of the new 15% target. Taking a similar approach to the Devolved Administrations will ensure a consistent approach across the UK.

97. The benefits of this approach should be more evidence-based planning decisions at regional and local level, so increased deployment of renewable electricity and heat. There will be a small cost to regions and Devolved Administrations for the assessment of potential, however this is not a new requirement. DECC and CLG will provide time-limited funding to support the evidence base in English regions over the next 12 months.

Bioenergy for Heat and Power, including Biomass Waste: summary of costs and benefits of measures

98. In order to assess the availability and cost of bioenergy across the different sectors of the economy, E4Tech were commissioned to assess the UK Biomass market and develop supply curves, including the availability of imports[14].

99. The study assessed the UK Biomass market under different future scenarios, including a RES world; where sustainability issues are prioritised and where high growth leads to strong competition for land and energy resources.

100. The results indicate that there could be sufficient biomass resource potential in the UK to meet demands from RES in 2020, and that imported biomass feedstocks could increasingly become a traded commodity. The analysis did not consider barriers to deployment and whether the domestic potential is fully developed will depend on how the market responds to the financial incentives being introduced in the RES, and to supporting measures aimed at developing the UK biomass supply chain and overcoming supply side constraints.

101. The study found that key factors affecting biomass resources and costs are: land availability for energy crops; energy crop yields and waste generation and management. Barriers to further development of these sources would mean that the supply potential would be lower. As supply and demand for bioenergy increases worldwide, the study found that a global market is likely to develop, so biomass demand and supply should be considered globally rather than focusing on supplies within the UK. This could result in global prices driving the biomass market, and that these are likely to be higher than indigenous UK feedstocks.

102. Biomass is a key renewable resource in the UK, and has an important role to play in meeting our target. The measures detailed below aim to facilitate the development of an effective supply chain for biomass products which is a necessary condition of achieving the levels of renewable penetration in 2020.

103. The bioenergy measures set out in the RES include:

Table 15: List of measures to encourage sustainable bioenergy for heat and power

a. Provide funding for a £1.5 million three-year research project to examine the feasibility of Short Rotation Forestry as a viable renewable energy source within England
b. Increase planting grants under the Energy Crops Scheme, to 50% of establishment costs
c. Work within Europe and internationally to develop efficient and effective sustainability criteria for solid biomass used for heat and electricity
d. Support for HETAS to run a pilot for fuel quality criteria with the wood-fuel supply industry

Short Rotation Forestry (measure a)

104. Measure a is an enabling measures. It will not generate carbon savings in its own right but enable carbon savings from heat and electricity measures to be realised.

105. The current biomass energy crops (short rotation coppice (SRC) willow and poplar, miscanthus and a range of coppiced tree species) were selected following research

[14] E4tech (2009): 'UK Biomass Supply Curve'

programmes in the UK and overseas. The new research will look at other species that may be suitable for use in specific locations or applications. Energy companies are particularly interested in the potential for fast growing tree species to provide woodfuel for electricity generation. Species such as alder, ash, hybrid aspen, birch, eucalyptus, nothofagus, sweet chestnut and sycamore can be harvested after 5-15 years, offering high yields in a short space of time. This short rotation forestry (SRF) can potentially give better energy returns than either traditional forestry or current energy crops. The field trials of these species will assess the viability, feasibility, sustainability and appropriateness of SRF, and will look at hydrology, carbon balance, economic viability and possible environmental risks, such as the impact on landscape, archaeology and biodiversity. If the trials demonstrate significant yield, cost and fuel quality advantages, it could lead to a major expansion of UK biomass production for energy generation based around these species.

Planting Grants (measure b)

106. Take-up by farmers of the planting grant available under the Energy Crops Scheme has been low and on current projections, the Scheme will fail to deliver the target of 60,000 ha to be planted by 2013. The European Commission's 2008 Common Agricultural Policy (CAP) Health Check permits the grant rate to be raised from the existing 40% of actual establishment costs to 50%. Stakeholders have indicated that although this higher grant will only give farmers a small increase in financial terms, it will send a positive message that the Government is committed to supporting perennial energy crops. This will help reassure farmers that there is a long-term future in growing the crops, which remain in the ground for 15 years or more.

107. Increasing planting grant will not require any increase in government funding. The funds for the increased planting grant under measure (b) will come from voluntary modulation money. This is collected by taking a percentage off subsidy payments made to farmers and transferring it to rural development and agri-environmental schemes.

Sustainability Criteria for Biomass for Heat and Electricity (measure c)

108. The Renewable Energy Directive (RED) placed an obligation on the European Commission to report on the requirements for a sustainability scheme for energy uses of biomass, other than biofuels and bioliquids, by 31 December 2009. This report will be accompanied, if appropriate, by legislative proposals for such a sustainability scheme to the European Parliament and the Council. Sustainability criteria for biofuels for use in the transport sector are dealt with in the Transport Impact Assessment.

109. After the Commission makes its report, and the content and coverage of its proposed scheme for biomass heat and power is known, we will be in a position to produce an impact assessment for the UK. In the interim, the UK and the EU has gathered evidence in the development and delivery of the biofuels and bioliquids sustainability criteria set out under the RED, and further work is underway. In addition, in the UK, we have carried out research to inform our approach to sustainability forestry. Under the Renewables Obligation Order 2009, we placed a requirement on renewable electricity generators over 50kW capacity to provide data to Ofgem on their biomass sources. This includes country of origin, biomass type, format, other uses of land within past 5 years and if it meets any sustainability standard and if so which scheme. Within the Renewable Energy Strategy, we commit to consulting on introducing similar reporting requirements for the forthcoming Feed-in Tariff and Renewable Heat Incentive. We will, therefore, be furthering our understanding of the potential impact

of introducing sustainability criteria on biomass users of all sizes as part of this consultation process.

110. Once the Commission has reported on its proposed sustainability critiera the UK will consider its impact and interaction with the financial support mechanisms – Renewables Obligation, Feed-in Tariffs and Renewable Heat Incentive - and develop an underpinning impact assessment. This will cover the related economic, social and environmental costs and benefits.

111. We will also introduce sustainability reporting requirement for biomass within the Renewables Obligation, and consult on a similar requirement for the Renewable Heat Incentive and Feed-in-tariffs in Great Britain. These consultations and the consultation on changes to the RO will include our approach to reporting on by-products and wastes. They will be accompanied by additional Impact Assessments.

Fuel Quality Standards (measure d)

112. While large-scale users of biomass are able to specify fuel quality standards within their supply contracts, smaller-scale users, and in particular domestic customers, rely on their suppliers to provide fuel of the correct type, size and moisture content. Using fuel which does not meet the specifications of the biomass unit can reduce its efficiency, increase maintenance costs and could increase particulate emissions.

113. A system to certify or guarantee the fuel specification of biomass could help ensure that fuels supplied are appropriate to the equipment and of a consistent quality and moisture content. The Heating Equipment Testing and Approval Scheme (HETAS) have proposed developing such a scheme which will operate on a voluntary basis.

114. Government will provide initial funding support for a champion to kick-start the process. They will work with the wood-fuel supply industry to agree fuel quality criteria and the process for the monitoring of fuel quality and its subsequent approval. The scheme will focus initially on solid wood, such as logs, developing knowledge and expertise in how such a scheme could operate on a practical, cost-effective manner. It will likely be trialled in one area of the country. HETAS expect to be able to recruit wood fuel suppliers to the trial in 2009, with the intention of developing a process which can be more extensively rolled out by 2011. These trials will also provide evidence of the costs of expanding the scheme.

115. Government considered the option of imposing a mandatory scheme on suppliers but considered that such schemes work best and at least cost when championed by industry.

Table 16: List of measures to support biogas, anaerobic digestion and biomethane

e. Provide £10 million additional funding for new composting and anaerobic digestion facilities
f. Develop a web based portal to act as a first point of contact for advice on anaerobic digestion
g. Consult on exempting biomethane producers from the need to hold a Gas Transporters' Licence
h. Publish guidance to the GB gas regulatory regime for potential investors in biomethane injection

116. Measure e covers the announcement, in Budget 2009, of an additional £10million of new grants for businesses to deliver anaerobic digestion and in-vessel composting infrastructure. This will provide capacity to remove 316,000 tonnes of waste each

year from landfill; reducing local Government and business waste disposal costs and generate additional renewable energy.

117. Measure f should help those considering anaerobic digestion by providing simple to find information as lack of access to information is considered one of the barriers to deployment. The cost should be minimal.

118. Measures g-h are enabling measures designed to remove barriers to those wanting to upgrade biogas into biomethane and inject it into the National Grid. Providing an exemption from the need to hold a Gas Transporter's Licence for biomethane producers will be de-regulatory and reduce costs.

119. Financial support for biomethane will be covered in the forthcoming Impact Assessment on the detail of the Renewable Heat Incentive.

120. Additional policies set out in the RES covering support for anaerobic digestion will taken forward through an Implementation Plan developed by a Task Group of key stakeholders. This makes recommendations to the relevant Department or Organisations for actions to increase the uptake of anaerobic digestion. If these recommendations result in policy changes, they will be accompanied by a full impact assessment and consultation.

Costs and Benefits of Biomass Waste measures

121. Currently an estimated 9 million tonnes of waste food and 6 million tonnes of wood are sent to landfill in the UK, with a combined energy value of approximately 40 TWh. Policy development therefore considered the costs and benefits of regulating to ensure more of the energy potential of this waste is exploited. The specific measures set out in this Strategy to address the barriers to the exploitation of biomass waste for energy are:

Table 17: List of measures to encourage further exploitation of biomass waste for energy

i. Consult on the scope for banning certain materials or kinds of wastes from Landfill
j. Publish a toolkit for Local Authorities to help them make public announcements on waste policy and communicate more effectively with the public
k. Report on progress on designing equipment and methodologies to enable the biomass content of solid recovered fuel to be determined cost-effectively
l. Implement a solid recovered fuel grant scheme (subject to state aids clearance)
m. Adapt the waste PFI scheme to encourage Local Authorities to offer long term contracts for the supply of waste wood (already undertaken)

122. Defra is undertaking further work to understand the potential costs, benefits and practicalities of landfill bans or restrictions, and will consult on this issue, with a separate impact assessment, later this year (measure i). This could potentially release the carbon potential of this material and reduce methane emissions from landfill (currently much of this landfill gas is already used to generate energy although less efficiently than the proposals outlined here). The associated costs for landfill are about £22 per tonne, and once the landfill tax has been added, the cost rises to close to £50 per tonne. The escalator is increasing by £8 per year, so the additional costs of alternatives to landfill reduce significantly depending on when a ban would come into effect

123. Measures j-k are enabling measures to ensure that the market works more effectively, and will help support the generation of energy from biomass waste. They will have minimal cost.

124. The SRF (solid recovered fuel) grant scheme (measure l) for England is intended to support companies wanting to convert from fossil fuel use to SRF, and to support the conversion of energy from waste electricity or heat only plants to Combined Heat and Power plants.

125. If state aids approval is granted, the current plan is for the scheme to provide £15m of grant per year which we estimate it will assist the creation of capacity to burn an extra 1million tonnes per year of SRF to create energy. It would provide time-limited support until March 2013 (prior to and immediately after the coming into force of the RHI in 2011). If State Aids approval is granted, Defra will implement this SRF grant scheme by 1 April 2010. Defra is currently considering implementation options.

126. There are a number of market failures that the grant scheme is intended to address including:

- the availability and capacity of plants in England to burn SRF to produce energy,
- the timing of new plants coming on stream; and
- the conversion to CHP of energy from waste electricity generators.

127. The energy benefits of using of more SRF (instead of fossil fuels) and combined heat and power are that it will increase the use of renewable energy (as the biomass component of SRF is renewable), increase energy saving and decrease reliance on fossil fuels and therefore and increase the security of energy supply.

128. The consultation for this Strategy also considered whether Government should mandate the separate collection of food waste and its use in anaerobic digestion to generate biogas. Since the consultation we have undertaken further research to understand the costs and benefits of these regulatory measures.

129. There would be costs to collect food waste separately and to require local Authorities to make food waste available for anaerobic digestion (ie to restrict it from being managed any other way). These wouldl be, to some extent, offset by the additional energy and other benefits (such as a reduction in landfill as described above and the production of the digestate which is a soil conditioner). The net costs of separate food waste collection for Local Authorities which do not currently already offer it, range from £7m to £137m. The benefit would be that between 2.8 and 1.8 million tonnes of additional food would be available for anaerobic digestion and energy generation. The large range of costs and amount collected is mainly due to whether the Local Authority retains weekly residual waste collections alongside weekly food waste collections.[15]

130. On balance, given the market may decide to react in a similar way without regulation due to the landfill tax and renewable energy incentives, we have decided not implement these measures for the time being. Moreover, there are pockets of dwellings – for example some inner cities, some high rise flats and some remote areas – where the costs of separate collection are much higher than the average. It would be difficult to devise a scheme which compelled collection where it was cost effective, whilst leaving authorities free not to collect from dwellings with higher costs.

[15] Trials carried out by Waste Resources Action Programme (WRAP) have shown that weekly food waste collection is more successful where there is not also a weekly collection of residual waste. WRAP (2008): 'Evaluation of the WRAP Separate Food Waste Collection Trials'

131. Defra and WRAP will work with the Local Government Association (LGA) to ensure that Local Authorities have access to the right information to enable them to decide when separate food collection and AD are appropriate. This work will include helping authorities to understand the benefits – including financial – of separate collection and AD, and exploring whether the flow of funds between collection authorities (who pay the costs of extra separate collections but do not gain the benefit of reduced disposal costs) and disposal authorities is acting as a barrier to renewable energy generation via AD. Defra have also undertaken to review whether market incentives and better information are having the desired effect on investment in AD by the end of 2011, and take further action if necessary.

NEW RESOURCES AND TECHNOLOGY: Summary of costs and benefits of policies to encourage innovation

132. In order to facilitate the achievement of our long-term climate change and security of supply goals and minimising their costs, we need to support innovation in new and emerging renewable energy technologies. To do this we need to provide both direct support for further-from-market technologies that are too risky and subject to knowledge spillovers for the private sector to be able to invest sufficiently alone; and set the correct type and level of incentives to encourage innovation for renewable technologies at the deployment stage. We must also provide clear leadership and signals to the market on technology policy and overcome information barriers, ensuring entrepreneurs and developers receive the right support and advice to get funding and progress with their ideas.

133. Policies relating to innovation in the renewable energy strategy include:

Table 18: List of measures to encourage innovation

• Show leadership to develop a shared vision of the potential technology and infrastructure requirements to support a 2050 low carbon society**.**
• Focus on a range of 'technology families' and prioritising our resources
• Launch the Energy Knowledge Transfer Network to promote collaboration and knowledge sharing between developers
• Form a more collaborative working arrangement between low carbon funding bodies to help accelerate technology development
• Additional Environmental Transformation Fund (ETF) support for Renewable technologies.
• European and international collaboration

134. The aim of these policies is to enhance funding, leadership and collaboration for technology developers and to help accelerate the development of renewable technologies. Developed in consultation with a range of stakeholders, the policies should overcome barriers blocking the development of new renewable technologies.

135. There will be costs in particular associated with the Budget 2009 announcement of £405 million to support low-carbon industries and advanced green manufacturing for, which will fall to the taxpayer. These measures should also provide long-term benefits in terms of enabling further renewable deployment in round 3 offshore wind locations and bringing on other technologies, and associated carbon reductions, so reducing the costs of achieving our carbon goals and developing new industries with export opportunities supporting new jobs. These benefits are uncertain and will

depend on the level of success of individual technologies, which is why we support a portfolio of new and emerging technologies

136. Policies centred on enhancing collaboration and coordination, focus on improving the existing innovation system by getting funding organisations and developers working better together. Development of action plans (>£30k each) will support the development of an evidence base for a technology prioritisation policy. The costs should be offset by better evidence to improve decision making and accelerated technology development.

137. The costs of the Knowledge Transfer Network will be met by the Technology Strategy Board and therefore ultimately by taxpayers. It will support UK collaboration with international companies to accelerate technology development as well as reduce administrative burdens on funders.

A ROLE FOR EVERYONE: summary of costs and benefits of policies to Increase engagement

138. We are **increasing funding to the Energy Saving Trust** to provide information on renewable energy solutions. This funding will help address one of the key barriers to small-scale renewable heat and electricity – lack of reliable and impartial information and advice.

139. The cost will be £1 million per year in 2009-10 and 2010-11 and the benefits will be the increased capacity of Energy Saving Trust to respond to queries on renewable energy solutions so increased deployment of household renewable solutions.

140. We are **providing new funding to develop an online 'How to' guide for community energy**. The details will be published in the Heat and Energy Saving Strategy later this year. The benefits will be increased information and advice to help communities, businesses and public sector organisations deploy renewables.

141. We are **considering whether a new delivery model is needed** for household renewables and energy efficiency. The decision on whether to take this forward will be made as part of the Heat and Energy Saving Strategy consultation. It would then be subject to full consultation and Impact Assessment.

142. We are providing **£10 million for 'Green villages, towns and cities'**, a new challenge for communities to pioneer green initiatives. This will involved 15 test hubs. The cost of administering the scheme will be £200,000. The benefits will be potentially increased deployment in the future.

143. We are **assessing the potential for renewable energy deployment on the public sector estate**, providing **additional funding** for public sector renewables and assessing the use of power purchasing agreements.

144. This would increase the deployment of renewable energy by the public sector, and would also act as an exemplar to stimulate further deployment by local communities, households and businesses.

145. We are **encouraging renewables developers to communicate with and provide benefits for local communities**. We are publishing a revised toolkit for developers, Local Authorities and community groups written for the Renewables Advisory Board. This will help developers engage effectively with communities.

146. We will continue to **monitor awareness of and attitudes to renewables** through our ongoing Renewable Energy Awareness and Attitudes Research, which is funded through DECC budgets.

IMPLEMENTATION: Summary of costs and benefits of policies on Flexibilities in the Directive ()

147. The RES sets out the circumstances under which the UK would be open to joint projects under the flexibility mechanisms provided by the EU Directive. Analysis of the potential benefits of joint projects is based on the report by POYRY (above), which assessed the renewable potential across EU countries compared with individual targets, and their associated costs. Analysis suggests that, if there was a fully liberalised and perfectly efficient cross-EU trading system, using the flexibility mechanisms to meet the last percentage point of our target could potentially save up to 9%-15% of total costs, or £400 million to £600 million in 2020. This estimate is very uncertain – both in terms of costs and in terms of how much trading other countries might be willing to undertake. In reality it is very unlikely that there will be such an open trading system, so corresponding savings are likely to be considerably less.

Monitoring and Evaluation

148. The EU Directive says that Member States' progress towards 2020 targets will be reviewed against an indicative trajectory, every two years from 2011 onwards. This indicative trajectory is non-binding. If Member States fail to meet their indicative trajectory, then they must re-submit their National Action Plans, showing how they plan to get back on track to meeting their target. As well as submitting information about how close they are to meeting their targets, Member States must report to the Commission on a number of other issues. These reports will form the basis of a Commission report to the European Parliament and Council every two years from 2012 onwards.

149. Under the Energy Statistics Regulation 2008 (and its previous non-statutory obligation), DECC already collects and passes to the Statistical Office of the European Communities (Eurostat) statistics on the production and consumption of energy. Eurostat have designed the targets so that they can be measured using an existing system. Whilst the we are currently able to provide all the data that are required the desired expansion of renewable heat and transport fuels will mean that additional statistics will need to be collected.

SPECIFIC IMPACT TESTS

Small Firms Impact Test

150. All small firms will be impacted through increased energy bills. However, the strategy will also create opportunities for small businesses – particularly those that operate in the micro-renewables sector such as the micro-generation suppliers and installers (covering small scale heat, electricity and energy efficiency), and biomass suppliers that are often small businesses. These small businesses should benefit from the new renewable heat incentive and feed-in-tarriff stimulating demand in their markets. Moreover, as some responses to the consultation pointed out, the new financial subsidies will support small businesses to install renewable technologies or energy efficiency measures which they would otherwise be unable to afford.

151. Most of the major policies outlined in this Strategy will be subject to further consultations to finesse the detail and consult on implementation. For example changes to the Renewables Obligation, and feed-in-tariff (FIT) will be subject to

further consultation in July 2009, giving small businesses the opportunity to feed in their views. For the RHI, we will be considering the impact on small business and the forthcoming consultations on the detail of the RHI will consider the implementation of thresholds and exemptions where there is a strong case to do so. The July consultation on the FIT is likely to consider the option of whether small suppliers should be exempt from the legal requirement to offer the FIT to customers (although of course, they may chose to do so). Moreover the FIT policy was designed to give small scale generators access to a reward regime that is more simple than the existing Renewables Obligation to enable them to receive support without a complex application procedure.

152. Where possible, the Strategy has considered non-regulatory approaches instead of mandating a solution. For example, Government has taken the decision not to regulate to require the separate collection of biomass waste or to mandate its use in anaerobic digestion facilities. The Strategy also sets out a voluntary, rather than mandatory, approach for fuel quality standards for biomass. In other cases, we have considered providing an exemption from small businesses such as in the UK's position on biomass sustainability criteria standards for the heat and electricity sectors.

153. Responses to the consultation from small businesses or their representatives, and Local Authorities indicated that small businesses are broadly supportive of the measures and do indeed see them as an opportunity to expand their businesses or benefit from financial subsidies to install renewable or energy efficiency solutions that might, in the longer term, reduce their energy bills. A number of responses, including the National Insulation Association and a joint response from the Regional Development Agencies, pointed out that the current subsidy and obligation structure do not support small businesses wanting to install either energy efficiency or renewable technologies, and welcomed the policies set out in the consultation to address this gap. The EEF also welcomed the fact that the new financial incentive for renewable heat would provide support for small business to use renewables, as existing schemes encourage large scale renewable deployment or renewables in the domestic sector, rather than small businesses.

Competition Assessment

154. As discussed above, there are specific market failures associated with climate change that require intervention by the Government. These policies would go some way to correcting these failures. However we must remain vigilant that our interventions do not unduly limit the number and range of firms in relevant markets, nor excessively limit firms' abilities and incentives to compete.

155. In the electricity sector, there are several potential impacts on competition from the RES. A higher level of intermittent generation is likely to lead to a greater amount of wholesale electricity price volatility. This should provide necessary signals to flexible generation to switch on and off, but may raise the cost of capital and hence barriers to entry. In general, however, the RO and other support mechanisms should help innovation and new entry to the renewable electricity market. Ofgem will monitor and promote effective competition in the gas and electricity markets

156. In the heat sector, providers of conventional sources of heating (such as heating oil) will be affected by competition from renewable alternatives and the implementation of the RHI levy of their products could decrease their competitiveness. There will be a need to ensure that energy suppliers will not have a disincentive to select certain customers because, for example they could be entitled to other forms of support. This

157. The large expansion of renewable energy may lead to supply chain capacity constraints and create new markets where initially a small number of firms have a large degree of market power, before new entry can bring competition fully to bear.

Sustainable Development

158. All policies to the meet our renewable energy target need to be underpinned by the principles of sustainable development which means integrating social, environmental and economic objectives. The challenge is to establish a consistent and comprehensive framework that is able to assess the positive contribution of renewable energy to tackling climate change against potential impacts on other sustainable development priorities – for example to achieve a sustainable economy that lives within environmental limits. The principles of sustainable development also require policies to be based on sound science and promote good governance.

159. The Statement from the Government's Renewable Energy Deployment: Environmental Issues Project Board highlights the importance of tackling climate change and endorses the need for renewable energy, while continuing to meet statutory obligations for nature conservation and minimising any local adverse environmental impacts.

160. Increasing the deployment of renewable energy and developing renewable energy infrastructure is a response to the science of climate change and the desire to move the UK away from fossil fuel dependency towards a low carbon economy in preparation for a future when supplies of gas and oil will become tighter and more expensive.

Environmental Impacts

161. Strategic environmental assessment is required in accordance with Directive 2001/42/EC (the 'Strategic Environmental Assessment (SEA) Directive) for certain plans and programmes which set a framework for future development consents. The RES is not subject to strategic environmental assessment under the SEA directive because it is a strategy of the policies needed to meet 15% overall renewable energy and does not set a framework for development consents. The RES does not set out binding targets for individual sectors or technologies. The RES does not laydown specific rules on which are appropriate or permissible developments in particular areas, neither does the RES provide criteria which might narrow the selection of alternatives available to the planning authority (a plan). Furthermore, the RES does not propose a set of projects within a given area (a programme).

162. Policies referred to in the RES to be implemented through plans or programmes setting the framework for development consent, will as appropriate undergo strategic environmental assessment of the plan or programme in accordance with the requirements of the SEA directive (such as that undertaken for the competition for offshore wind). DECC are currently undertaking an Appraisal of Sustainability for the Renewable Electricity Generation National Policy Statement. The Appraisal of Sustainability for the Renewable Electric Generation National Policy Statement incorporates the requirements of the SEA Directive.

163. Individual projects that are deemed to have the potential to cause significant adverse impacts are required to undertake an Environmental Impact Assessment (Directive 85/337/EEC) as part of the planning process.

164. Further consultations on each of the financial instruments (the Renewables Obligation, the Feed in Tariff and the Renewable Heat Incentive), all due in 2009, will individually consider the environmental impacts of the subsidy within each of their Impact Assessments. Any environmental impacts will need to be considered within the broader aim of these incentives which is to increase the proportion of the UK's energy needs that comes for renewable sources. We will be including further detail on specific areas of sustainability, such as those detailed below, within the upcoming consultations.

165. The sustainable use of by products, co products and wastes is a key issue within the Renewable Transport Fuel Obligation, RO and the RHI. We have started a study to develop a methodology that will attempt to predict the indirect carbon emissions that may result from the use of such products within government renewable energy support schemes. This work is the first of the kind in the world.

166. We are strongly of the view that all biofuels and biomass used in the UK should come from sustainable sources and are active in the EU and internationally in seeking agreed definitions. On biofuels we have, since the consultation, slowed down the rate at which the renewable transport fuel obligation level increases to allow us to work towards securing the longer term sustainability of biofuels.

167. Energy Crops such as short rotation coppice and miscanthus are already subject to environmental assessment as part of the Energy Crop Scheme. For example, water pollution is taken into account in the Energy crops scheme and the Forestry Stewardship scheme. The Forestry Commission publishes guidelines for these schemes and the forestry industry on planting, use of nutrients, avoidance of water pollution and other issues. The research and field trials on new energy crops will consider the requirements for water and nutrients and whether these are less than existing energy crops as well as visual impacts.

168. We have considered the potential impact on air quality of increasing the number of small scale biomass boilers to generate heat. In response to this analysis, the Renewable Energy Strategy sets out a range of policies to ensure that these impacts are kept to a minimum and that air quality standards are maintained. Analysis indicates that ensuring high quality product standards and providing guidance and advice on where biomass boilers can be installed safely provide the necessary safeguards to maintain air quality standards. Our estimates for the cost-effective contribution that small scale biomass heat generation could make towards the UK target are constrained by the possible air quality impacts.

Health Impact Assessment

169. Increased burning of biomass will have an effect on air quality. Increased use of biofuels in transport will also have an effect on air quality, reducing emissions from fossil fuels but increasing certain emissions from biofuels. Air quality regulations will not be changed – existing air quality standards will be maintained. This is discussed further in the Heat Impact Assessment and will be looked at in more detail during the further consultations on the financial incentives later this year.

Rural Proofing

170. A large proportion of renewable energy is produced in rural areas, particularly for certain forms of renewables such as onshore wind and biomass. It is likely that a significant proportion of new renewable developments will occur in rural areas. The increase in renewable energy will affect businesses involved in the generation of renewable energy, including farmers who produce energy crops and biofuels. Most of these are likely to benefit from the measures set out in this Strategy. We have not quantified these benefits but they are likely to add significantly to farm income as prices for biomass and food rise due to the increased demand for agricultural products. It will also affect rural communities living in the vicinity of new developments (e.g. windfarms and biomass generators), including the visual effect of the renewable installations.

171. The policies set out in this Strategy will raise energy prices, which would affect rural customers (as well as urban customers). However it is likely that that impact of this would be greater in urban areas, as this is where most energy-intensive industries are located. However, most customers off the gas grid live in rural areas, so, in the future, the uptake of renewable heat may be higher amongst rural populations who do not access to gas and rely on more expensive heating fuels such as oil. This additional incentive coupled with the special needs of some renewable technologies may allow rural households to benefit from the financial incentives set out in the Strategy more than urban households. For those that do switch to renewable forms of heating, once installed, heating bills should be lower than using oil or electric alternatives, which will be subject to the RHI levy.

172. There has been no separate or explicit assessment of the needs of rural areas.

173. Certain forms of renewable development impact disproportionately on rural areas, and there is often resistance to new developments from rural communities. Any resistance to new renewables projects has to be viewed in the light of the Government's commitment to source an increasing proportion of energy from renewable sources, in order to combat climate change. The planning system also has a role in ensuring that new developments are sited in suitable locations.

Specific Impact Tests: Checklist

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

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

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

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Annexes

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