

DRAFT OPTIONS PAPER ON RENEWABLES TARGET

This paper asks ministers to:

- Note developments in the EU and Commission on the 2020 renewables target
- Note estimates of the cost to the UK of implementing different levels of increase in renewable energy consumption by 2020
- Note analysis of burden sharing options for the EU target and what target the UK might be asked to take on
- Agree that we should seek maximum flexibility in Commission proposal for directive to implement the renewables target.
- Agree the range of ideas on which we engage the European Commission and other member states

Background

1. Heads of Government agreed a binding target for 20% of energy use to come from renewable sources in 2020. Currently, the EU average is 7%. The target includes a sub-objective of using 10% biofuels by 2020, subject to other assessments such as sustainability and the emergence of third generation biofuels.
2. Increasing renewable energy use is seen as beneficial for energy and climate change objectives - contributing to diversification of the fuel mix and therefore security of energy supply and lowering greenhouse gas reductions by replacing existing fossil fuel generation. Investing in renewables in the EU may also help build a strong industrial base for future leadership in clean energy technologies.
3. However, implementing the renewable energy target may be difficult to reconcile with other measures to tackle climate change:

Impact on the EU ETS: if the EU has a 20% GHG target for 2020, the GHG emissions savings achieved through the renewables target and energy efficiency measures risk making the EU ETS redundant, and prices to collapse. Given that the EU ETS is the EU's main existing vehicle for delivering least cost reductions in GHG, and the basis on which the EU seeks to build a global carbon market to incentivise international action, this is a major risk.

Remedies to overcome this risk will be difficult to agree or ineffective. Expanding the scope of the EU ETS to include aviation emissions would not by itself create enough demand to overcome price collapse. Tightening EU ETS caps to reflect the renewables target imply taking EU wide emission reductions beyond the 20% GHG target which would be difficult to agree in the EU. Relying on later agreement to a 30% GHG target to rescue damage to the EU

ETS is risky if 30% is not realised, and if not, clarity in 2009 or so on this, would be very late for re-designing the ETS or renewables target in response.

Impact on costs of meeting EU and UK GHG targets: The costs of increasing renewable energy technology use to reduce GHG emissions is around three time higher than allowing flexibility in reduction options through emissions trading. This additional cost will be reflected in increasing electricity and other energy prices, with impacts on UK competitiveness, fuel poverty objectives.

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4. There is also an issue in the timing of decisions on EU GHG target and agreeing a renewables directive. As GHG targets defined the total GHG reductions needed across the economy, there are risks of agreeing to a burden sharing agreement on renewables without knowing how much of a share of the overall GHG objective this might take up. As renewables are more costly than other measures to reduce GHG, if the tranche of reductions to be made through renewables turns out to be a high proportion of the GHG target, this will restrict flexibility and make it difficult to take on ambitious GHG targets. The UK will take an as yet unknown share of the EU GHG which is set to be at least 20%, but could be more if international action is agreed for post 2012.
5. EE Committee considered a paper that highlighted these problems in detail. The DTI was asked to consider this in more detail with a view to finding options that could reconcile these risks. EE committee also asked for more work on what the UK can deliver to contribute to the binding EU 2020 target.

Developments in the EU since end April 2007

6. Following the last EE Committee, DTI Ministers and officials from DTI, DEFRA, HMT and UKREP have met with various Commission stakeholders including Commissioners, Cabinets and officials to:

- Stress the importance of an holistic and integrated approach to implementation of the energy and climate package agreed at the Spring Council.
- * • Explain the tensions between the renewables target and EU ETS.
- Highlight the need to consider the renewable energy target within the wider context of the need to meet the EU GHG target at least cost and support an effective EU ETS.
- Highlight that there may be options to resolve these tensions and make the three issues compatible.

7. So far, this engagement appears to have been successful, with thinking moving in the right direction over this period of engagement. Following meetings last week in Brussels, our understanding is that at the highest levels of Commission (Barroso Cabinet, Sec General) as well as the cabinets of Commissioners Piebalgs and Dimas, there is now acceptance the need to develop policy from the Spring European Council coherently. Piebalgs and Dimas cabinets are planning to publish the Renewables target draft directive and the Review of the EU ETS as one package in December. On the particulars of the solutions, discussion with Dep head of Piebalgs cabinet, Chris Jones, shows he is thinking along similar lines to the UK in terms of the need to use flexible approaches such as EU wide trading to meet a renewable target, and crucially, that any system must underpin a strong EU ETS as a key objective in deciding on what solution to go for.
8. This is reassuring, but of course, for this type of framework to form the basis of the proposal at the end of the year, DG TREN and DG ENV cabinet will need to be able to hold this line with the rest of Commission cabinets and the services, and then with other member states, for such a framework to form the basis of the proposal at the end of the year.
9. Influencing key member states views is therefore crucial at this point and going forward. DTI officials have met with the majority of larger Member States to scope their emerging views on burden sharing and implementation of the renewables target and to share views. Given the relative sizes of different Member State energy markets, and the arithmetic for burden sharing, only five other major economies really matter in terms of delivering the target: France, Germany, Italy and Poland.
10. **France** shares our views on the primacy of GHG targets, but extensive low-carbon generation (nuclear) could result in a relatively light burden for them. **Germany** are strong proponents of the renewables target, i) given the sensitivity of nuclear in coalition politics, ii) a strong and growing renewables industry and iii) because Merkel personally championed it at Spring Council. However, Germany recognises that renewables are expensive and will be concerned over competitiveness effects. Most Member States are likely to concentrate on burden sharing negotiations, rather than creative interpretation of the target itself. This is currently the case in relation to **Italy** who want the burden sharing methodology to take account of climatic conditions.

What burden sharing target might the UK be asked to take on?

11. Analysis of burden sharing methods that could be used show that the UK could be asked to take on a targets of at least 9% to 16% by 2020. These are high as the UK has achieved little so far on renewables, has some potential for increases in renewables deployment and is also relatively wealthy.
12. The Commission have not yet indicated what their approach will be. There are several methods that could be used that incorporate assessments of potential based on renewables energy resources eg. wind sites, as well as consideration of ability to pay and progress to date on use of renewable energy. The method that DG TREN have described in meetings with UK officials is based on targets starting at a base of 13% (which is the gap between current EU consumption and the 20% target), then adjusting by on or two percent up or down, depending on achievement so far and whether you are a wealthier country. This approach could give the UK a target of around 16% which would be very challenging.
13. Burden sharing of the EU 20% target will be difficult to agree with member states, particularly if based on potential alone as a lot of the best resources are in the newest member states. Avoiding difficult burden sharing discussions will be more likely if the approach in the directive is seen as less binding or prescriptive, at its most flexible for example relying on existing measures such as the EU ETS to deliver an increase and then simply monitoring what happens with a review between now and 2020.
14. Commissioner Piebalgs is expected to begin a tour of capitals between now and the Autumn to discuss approaches to the directive and burden sharing. It is therefore urgent that ministers agree lines to take with the Commissioner over the summer- see paragraph 17 below.
15. In terms of what target the UK could have, several methodologies could be considered, with resulting range of for the UK and EU member states as in Table 1 below. The methodologies could be based on:
 - (i) **Simple proportionate increase.** This approach takes existing endowments of renewable energy or projected levels under current measures across all Member States and pro-rates to the 2020 target level.
 - (ii) **Reward early Action.** As above, but make some allowance for early action, so those with low renewable energy resource are expected to do more. This is similar to a 'convergence'

approach and resulting targets are more equal across Member States than under (i).

- (iii) **Reward low carbon generation.** This approach builds on run (ii), but makes an adjustment for the amount of nuclear generation across member states. Countries with above average nuclear generation have their renewable target adjusted downwards and vice-versa. As there is little or no CCS projected by 2020, this has not been taken into account.
- (iv) **GDP.** Takes account of relative wealth of different member states, and their ability to undertake the necessary investments. This is done by comparing GDP across the EU.
- (v) **Least cost across the EU**– this is based on Commission 'Green-X' modelling which looks at the least cost way of achieving the target across the EU
- (vi) **'Balanced' least cost across the EU**– a 'balanced' scenario from the 'Green -X' model, which equalises effort across sectors.

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Table1 :summary of UK and key member states share of the overall target under different burden sharing approaches

Burden Sharing Approach	Target for delivering renewables in the UK	[DN- insert France, Germany, Italy, Spain, Poland]
i. Simple pro-rata	9%	
ii. With early action	13%	
iii. Take account of low carbon generation	14%	
iv. Take account of ability to pay		
v. Green-X least cost	14%	
vi. Green-X balanced scenario		

now close to 20%

16. It is important to note that only option 1 and option 5 are a reflection of what targets could be assigned based only on what could be delivered within the UK. The others are a combination of this with adjustments for other factors.

17. **Recommendation:** the UK should ask the Commission to consider a range of possible approaches to burden sharing, signalling that
- agreeing an approach to the directive will be necessary before agreeing any burden sharing target
 - the more flexible the approach in the directive, the easier it is to take on a burden sharing target.

What can we deliver in the UK and at what cost?

18. DTI and DfT officials have been working on what the UK can deliver in increasing renewable energy use in heat, electricity and transport. Particular questions on how security of supply will be affected, impacts on electricity prices, how electricity plant investment decisions will be affected are being considered. Several pieces of independent analysis will be commissioned to look at some of these issues in more detail to report back in the next few months.
19. Although analytical work is on-going, some examination of the potential and costs of the UK meeting different targets has been undertaken. A range of scenarios for targets have been considered as illustrated in the Table 2 below:

Table 2: UK targets for renewables and contribution by sector

	Scenario 1 10% primary energy	Scenario 2 11% primary energy	Scenario 3 14% primary energy	Scenario 4 15% primary energy	Scenario 5 20% primary energy
% primary energy by sector					
Heat	12	5	6	12	12
Road Transport	10	5	8	10	15
Electricity	16	27	36	33	43
Average % for all sectors	9	10	14	15	20
Equivalent % of electricity in final consumption definition					
Electricity	20	38	47	40	60

20. These scenarios were chosen to illustrate the difference in cost of achieving different percentages of renewable energy, through effort in different sectors:
21. All scenarios represent a huge increase in deployment of renewable energy technologies from the UK's base position in 2005 of 1.5%, and also from our forecast of around 5% by 2020 (based on current policies). The table also shows the

percentage of final consumption in the electricity sector, as our current target is based on this definition. We are currently forecast to achieve around 15% renewable electricity (with banding) by 2020.

22. What the costs of these five scenarios would be for the UK is still very much work in progress, with considerable uncertainty associated with what actual costs may be. Nevertheless, the figures indicate the relative differences in total costs in 2020. A 10% primary energy target could cost approximately £4 billion by 2020, whilst a 20% primary target could cost up to £22 billion by 2020. Table 3 shows the rough estimates by scenario with a breakdown of costs to different sectors.

Table 3: UK costs of achieving the different renewables scenarios

Cost to UK as £billions pa 2020	
Scenario 1 - 10% primary energy (increase in renewable energy 21Mtoe)	
Electricity Costs	3.5-4.2
Heat Costs	<0.1-0.1
Transport Costs	<0.1-0.1
Total Costs	3.6-4.4
Scenario 2 - 9% primary energy (increase in renewable energy 22Mtoe)	
Electricity Costs	0.5-0.6
Heat Costs	0.2-0.4
Transport Costs	0.1-0.7
Total Costs	0.9-1.6
Scenario 3 - 14% primary energy (increase in renewable energy 40Mtoe)	
Electricity Costs	8.5-10.2
Heat Costs	<0.1-0.1
Transport Costs	0.1-0.5
Total Costs	8.7-10.8
Scenario 4 - 15% primary energy (increase in renewable energy 47Mtoe)	
Electricity Costs	4.4-5.3
Heat Costs	0.2-0.4
Transport Costs	0.2-0.7
Total Costs	4.8-6.3
Scenario 5 - 20% primary energy (increase in renewable energy 60Mtoe)	
Electricity Costs	17.3-20.8
Heat Costs	0.2-0.4
Transport Costs	0.3-1.2
Total Costs	17.8-22.4

23. Although these cost figures are very rough at the moment, and will need to be updated, there are some key messages to be drawn from the exercise:
- **The cost of achieving different renewable energy targets varies considerably depending on the level of effort assumed from each sector** - assuming a high level of effort from the electricity sector is very costly;
 - **There is considerable uncertainty underlying the costs of renewable heat.** They depend on estimates of the technologies deployed. Costs in Table 3 assume a high proportion of biomass technologies – which is higher than current independent estimates by Ernst and Young. If less biomass is available and other heat technologies need to be deployed, costs would rise rapidly;
 - **There is also considerable uncertainty associated with costs of increased use of biofuels in transport.** The costs will depend in large part on the relative prices of biofuels and their fossil fuel equivalents, both of which are highly uncertain;
 - **Increased energy efficiency markedly reduces the cost of achieving any targets.** The 'with efficiency improvements' estimates assume 20% energy efficiency in the heat and electricity sectors, and a 3.6 percent fuel efficiency saving in the transport sector. It is assumed that efficiency savings are cost-effective.
24. It is important to note that supply constraints are a major uncertainty on what costs could be, as well as the ability to meet any particular UK target. More work is needed on this, but initial analysis suggests that availability and sustainability of biomass are major constraints for increasing renewable energy in road transport and heat. For the electricity sector, overcoming constraints such as planning and grid connections, as well as the availability of wind turbines would be major challenges to delivering increases that are significantly more than current UK policy has contemplated. Annex A outlines more detail on existing analysis of UK constraints.

Conclusion on what UK could deliver at reasonable cost

25. Considering these are still very estimates, we consider that a possible target for UK renewable energy in 2020 could be based on scenario 1, which has 10% transport, 12% primary heat and 20% electricity by final consumption. **This would equate to a challenging (but achievable?) renewable energy target of delivering around 9% renewable energy use in the UK by 2020, at a cost of approximately £4 billion.** [DN-We know this needs more work but would appreciate initial reactions].

26. We need to do a lot more work before this can be firmed up, but ultimately, this assessment will feed into deciding what a final UK burden share should be. If the UK eventually decides to accept more in its burden share than is judged to be possible to deliver in the UK at reasonable cost, then to limit increasing costs to the UK will require some flexibility to perhaps deliver some of the target at a lower cost outside the UK. These flexibilities in interpreting the EU renewables target are discussed below.

Analysis of options to interpret the EU renewables target

27. DTI officials have been working up further analysis of options for meeting the EU target. These fall into two categories:
- What interpretation and delivery mechanisms could be used to meet the target, in particular options that resolve the risks to the EU ETS and lower overall costs.
 - What options there are for statistical interpretations of the target that would make it easier to achieve

Options for delivery mechanisms

28. There are several approaches to how the EU 2020 renewables target could be delivered that can be grouped in terms of:

1) Scope for flexibility on where investments are made: we could deliver increased renewables not just within the member state, but also allow them to be delivered within the EU/ internationally. A sub-option of this approach would be to cover some sectors by trading, say only EU electricity producers with an obligation to deliver the Commission's expected contribution of 34% renewable electricity in 2020.

Pros: allowing full flexibility to invest in renewable energy in other parts of the EU, and even more helpfully, in the developing world would deliver the least cost outcome to meet 2020 target. The theoretically neat instrument to achieve this would be using tradable 'green energy' certificates across sectors and across member states. Allowing energy investments made in the developing world, possibly through the Clean Development Mechanism to also count, would boost EU investment in high quality sustainable development projects, for example, through solar energy projects in North Africa.

Cons: there may be difficulty in imposing tradeable certificates across all sectors in the EU, and many member states may be resistant to a system which implies a harmonised instrument upfront. Even in an electricity only system, there would be resistance to using trading, which may be difficult to run alongside national feed-in tariffs. Use of non-EU investments

could be seen as watering down the commitments to boosting investment in the EU.

- **2) Scope for flexibility on what is counted towards meeting the target:** allow 'equivalent' GHG reductions that investments in renewables would deliver to be made by member states through the EU ETS or internationally to count towards meeting the renewables target
Pros: this broadens options beyond renewable technologies to all GHG reducing technology, therefore lowering costs. It directly supports the EU ETS and could be used to support the CDM.
Cons: there may be strong opposition to this on the grounds that this re-interprets the renewables directive as a GHG only instrument. It may be acceptable with some limits on how much GHG equivalence can be used.
- **3) Relying on EU ETS and existing national measures to deliver renewables target:** we could agree to use the EU ETS to deliver increasing renewables and therefore not require separate instruments for a renewable energy target either at the EU level or in member states. The directive could ask the Commission to monitor what happens, with agreement to review progress before 2020, introducing new measures if necessary at a later date.
Pros: boosts the central role of the EU ETS to deliver low carbon investment in the EU. Most pragmatic option as does not require a new mechanism for renewable energy specifically and may avoid need for burden sharing. Also does not require pre-emptive decision on renewables policy ahead of EU agreement on GHG targets and the Review of the EUETS. Allows for renewables target to be viewed as aspirational with flexibility say to amend when more information is available on costs of other key technologies such as CCS.
Cons: makes it uncertain how the target will be delivered if at all in 2020. Member states who are keen on enforcing renewable energy investment more specifically than through using the EU carbon price will argue this is watering down commitments.
- **4) Amend the EU ETS cap to reflect renewables target measures in BAU baseline:** if there are separate renewables target measures, we can ensure a strong EU ETS by tightening the cap to reflect achievement of renewables target in the baseline for the EU ETS cap.
Pros: Maintains a positive price and clear role for the EU ETS.
Cons: Adjusting the EU ETS cap to deliver savings on top of what the renewables target is expected to achieve would take overall EU reductions in GHG beyond 20%. This would be resisted by member states if it was imposed ahead of final agreement on the EU GHG target.

- **5) Use of price caps/ penalties:** in conjunction with any approach, there could be a limit on the cost of measures to meet the EU or member state target. This would work like a 'buy-out' option, where instead of meeting targets, there are 'buy-outs' the funds from which could then be used to invest in a related activity such as R&D in renewable energy or GHG reductions. Another variation of this would be a simple penalty system which is invoked by the Commission if member states fail to meet their targets.

Pros: capping the costs of meeting the target would be important if costs rise particularly in terms of the impact on electricity prices. A cap would be particularly useful if there is limited flexibility in how to achieve the overall target. The existence of penalties could be important as a means of ensuring that difference in effort by member states in implementing the directive is not completely costless.

Cons: a cap on prices makes the quantity of renewables delivered in 2020 more uncertain, and could be argued to water down commitment to delivering renewable energy investment in the EU for reasons other than GHG reductions or diversifying the fuel mix. A harsh penalty system could force member states to push through costly measures to meet the target. It would be difficult to agree to a 'buy-out' system that involved recycling of the revenues for distribution by the Commission

- **6) Considering the role of CCS/ nuclear:** similar to option 2, looking at member states action on renewables in the context of progress using other low carbon energy sources could be used.

Pros: broadening the portfolio of technologies improves flexibility. In the case of CCS and nuclear, it also means that should these technology costs turn out to be competitive in the next decade or so, then a more cost effective solution to meeting GHG reductions will be possible. Allowing CCS development in the EU to count could also boost incentives for this technology which is equally important for tackling climate change and security of supply globally.

Cons: may be difficult to agree amongst member states with strong views against nuclear, and be seen to water down the commitment to specific renewable technology development in the EU.

29. The impact of some of these different approaches to flexibility on costs to the EU and impact on the EU ETS is outlined in Table 4 below.

Table 4: Estimated impact on costs of different flexibilities for renewable energy target

	Estimated cost to EU in 2020 *	Does it help EU ETS?
National measures only - member state must deliver increase domestically	More than €24 billion	No
Allow EU wide trading in renewable energy certificates	€24 billion	No
Allow use of CDM renewable energy investments	€22 billion	Yes- additional demand for some CDM projects would push EUETS prices up, but only marginally. Moves base EU allowance price from €16 to €19.
Use any CDM projects as equivalent reductions in GHG	€15 billion	Yes- additional demand for all CDM projects would push EUETS prices up most significantly of other options. Move from base EU allowance price of €16 to €42.
Use EU ETS as equivalent reductions in GHG	€20 billion	Yes- adding significant additional demand in the market causes price to jump upwards. Move from base EU allowance price of €16 to €40.

*: Note all figures based on underlying Commission model figures. UK officials view these as underestimates of the final costs.

30. From a UK point of view, given the concern on not undermining the EU ETS, and the difficulties of making large increases in renewable investment domestically, we would tend to favour options with maximum flexibility over what and where investments can be made to minimise costs, and also support the EUETS. In terms of order of preference, this would be options that include relying on the EU ETS to deliver increases and reviewing later on, options that allow for GHG equivalent reductions to be counted and amending the EU ETS cap to reflect achievement of the renewables target. We need to do more work on the practicalities of how more flexible options such as EU wide renewable trading would work before coming to a final view on a single preferred approach. In the meantime, we recommend that the UK continues to push for the need for an open minded approach to flexible options that deliver a consistent, cost effective EU package. See Annex C for more detail on negotiability of options.
31. These flexible options are however ones that may be difficult to negotiate with some member states such as Germany who we expect to resist approaches that may be seen to water down the renewables target. To this extent, the arguments based on the differences in costs and overall consistency of EU policy will be

very important. Following meetings in Brussels last week, we are expecting the Commission to focus on consistent proposals with a view to what is efficient at the EU level, so will work to support this view amongst other member states in the next few months.

Statistical approaches to interpreting the target

32. There are differences in the achievability of the target if it is defined as final energy consumption as opposed to primary consumption. This statistical interpretation can be used to make achievement of the target easier, regardless of whatever the final mechanism for the target's implementation is. Such an approach may help
33. We need to continue analysis of this approach, but assess that discussing it with the Commission now would distract attention from our initial objective to get a more flexible approach to options.
34. **Recommendation:** ministers are asked to agree that
 - we should outline the range of 'flexibility based' options identified above to the Commission, noting the attractiveness of using options that can reduce the costs to the EU, support the EU ETS and increase incentives to help developing countries invest in renewable technologies.
 - We signal to the Commission that although we have yet to commit to any particular approach, we are likely to look at least for options that retain flexibility to use non-EU energy investments to count towards the target.

Business and other stakeholder views

35. **Credibility of the EU 2020 renewable energy target itself is a major theme.** The ambitious nature of the target itself means it lacks credibility- a recent gathering of financiers to discuss the issue suggested that the target is unattainable, and business will need some convincing that it therefore will be strictly enforced and therefore provide much of boost in EU investment.
36. UK energy companies have stressed to DTI officials that requires a massive step change across major economic sectors which will be very challenging given the constraints on what costs will be acceptable and key supply constraints such as planning.
37. Stakeholders such as the Renewable Energy Association believe the target is achievable but should be based on a

comprehensive plan of action- including energy efficiency to reduce the overall burden.

38. A UK stakeholder engagement strategy is being developed to include business, NGOs, finance sector and other parties more closely in our thinking going forward.

EU Engagement and action

39. Key milestones for engagement of the Commission and development of the directive are as follows. All dates beyond this summer are inevitably tentative

<i>Initial burden Sharing discussions</i>	<i>Jul/Sep 07</i>
<i>Publication of draft directive</i>	<i>Nov/Dec 07</i>
<i>Detailed discussion in energy working group</i>	<i>From Jan 08</i>
<i>First orientation debate in Energy Council</i>	<i>Feb 08</i>
<i>Political agreement in Council</i>	<i>Spring Council 09</i>

40. UKREP's advice is that we should concentrate our influencing primarily at senior level within the Commission where the decisions over approach will be made. Meetings are planned before the summer with the Cabinets and the two relevant Directors General., As we develop the UK's position and a detailed understanding of the issues, we shall engage with the Commission at all levels to press for an acceptable draft directive
41. Alongside this, we will continue to engage and lobby Member States towards the emerging UK position. Extensive ministerial and senior level official engagement with the forthcoming EU Presidencies, larger Member States, like-minded allies and EU representative organisations has already taken place and a programme of continued engagement over the summer will aim to secure a draft directive that is largely aligned to the UK position.

Next steps in UK

42. We will continue analysis over the summer on UK and EU costs, impacts on electricity prices and security of supply of different targets and the second order impact of costs on UK and EU competitiveness.
- 43.

Annex A- Analysis of UK supply constraints

Road Transport

44. The main constraints on increasing renewable energy in fuel use are the constraint on the land available for biofuels, and the sustainability of imported biofuels. It is expected that if half the 5% (by volume) RTFO target of biofuels is met from UK-produced arable crops, that this will use the majority of arable land available for bioenergy production in 2010. The Government is committed to increasing the level of the RTFO above 5% (by volume, equivalent to 3.5% by energy), but only provided that: (i) the biofuels can be produced sustainably (ii) vehicle and fuel technical standards are revised to allow vehicles to run on higher blends of biofuel (iii) the costs to consumers are acceptable.
45. Because biofuels have a lower energy content than fossil fuels, achieving a 10% (by energy) target would mean biofuels making up around 13% by volume of total transport fuel sales. Achieving this would be very challenging and would require almost a tripling of biofuel sales in the UK between 2010 and 2020, and a 25-fold increase on 2006 sales levels. This could have significant cost implications to the economy as a whole, as well as bringing risks that the production of the associated feedstocks might have adverse impacts on the wider environment as well as on other sectors (including the food market).
46. To extend beyond the current RTFO target in the UK will require more imported feedstocks and fuel. There will inevitably be issues in terms of ensuring sustainability. The carbon savings offered by different biofuels, and the wider environmental and social impacts of the production of those fuels, vary significantly according to how and from what they are produced. The Spring Energy Council Conclusions made it clear that biofuel targets must be subject to biofuel production being sustainable.

Heat

47. Barriers to the provision of renewable heat are availability of biomass and uncertainty around its price. Demand for biomass is also constrained by the number suitable sites (assumed to be off-gas sites, with sufficient space to process the biomass). Ernst and Young estimate that renewable heat could meet 5-12% of the heat market [by 2020?]. This assumes fairly constrained use of biomass. More optimistic estimates of the number of potential biomass sites, and use of imported biomass, could increase technical potential to 20%. These estimates are very uncertain.

Electricity

The potential for renewable electricity is based on the Ernst and Young¹ study on costs produced for the banding of the RO. Estimates are bottom-up and constraints vary by technology. For onshore and offshore wind, key constraints are the availability of turbines, planning and grid constraints. Biomass is constrained by availability of biomass products. Ernst and Young's study was based on industry expectations during late 2006. Based on the Government's domestic aspiration for 2020 the industry expected that the maximum amount of renewable generation likely by 2020 would be around 75 TWh – or around 20% electricity (on a final consumption definition), given current constraints. The Ernst and Young report did not consider scenarios with over 20-25% electricity and the costs for scenarios above will therefore need to be subject to further analysis. The upper segments of the supply curves presented in the Oxera report were included for completeness only and are based on comparatively crude assumptions

¹ E&Y Ref

Annex B- assessment of burden sharing methodology- see paper

Annex C : Assessment of options against criteria

	Estimated cost to EU in 2020	Does it help the EU ETS?	Impacts on other EU/international climate objectives	Negotiability
National measures only	More than €24 billion estimate for EU optimisation approach- final cost depends on what measures member states use	No- still a risk of zero carbon price if stick to 20% GHG target	Undermining EU ETS will prevent incentives for CDM purchase. Will take overall EU GHG reductions beyond 20%	Simplest strategy for Commission as comes down to agreeing measures to meet the individual burden sharing targets. However, uncertainty over whether the target will be met, and therefore its credibility is most extreme with this option. The Commission may be tempted to develop a strict penalty system to ensure member states meet their burden- but unclear whether the Commission will be able to enforce it and therefore prevent gaming between member states on whether or not to bear the costs and meet the target or miss it and potentially bear less costs.
EU wide trading	€24 billion	Not in itself- still a risk of zero carbon price if stick to 20% GHG target	Undermining EU ETS will prevent incentives for CDM purchase.	Could be difficult with split views in member states. Requires building an EU wide mechanism that will shift investment to where cheapest. May be resisted by member states as 'harmonisation' and complex to run alongside national measures eg. feed-in tariffs. But EU 'target and trade' approach means 2020 target is met at least cost, with burden sharing deciding who will pay. This is attractive to new member states who have potential to attract significant additional investment.
Use CDM renewable energy projects	€21.5bn - €21.8bn The difference to EU cost is not very large as several factors affecting the costs are the same regardless of where the technology is	Yes- additional demand for some CDM projects would push EUETS prices up, but only marginally. Moves base EU allowance price from €16 to €19.	This would develop an extra source of demand and therefore revenue stream for high quality CDM projects in renewable energy which is consistent with EU aims to improve scale up the CDM and therefore investment in the	This could be used as a mechanism alongside EU wide tradability, as well an option alongside a 'national measures only' system where countries to make up a shortfall on their burden sharing target by investing in cheaper non-EU projects. Commission and member state may resist use of non-EU investment over fears of 'quality' of projects. However, improvements to the post 2012 CDM are a major EU objective, so this could be overcome. There is some reduction in costs – but the ability to argue this option as useful to EU efforts to support 'quality' international action make the option very attractive.

Use any CDM projects as equivalent reductions in GHG	placed. €14.6bn - €16.0bn The largest difference in cost as many GHG reduction investments outside the EU are substantially cheaper.	Yes- additional demand for all CDM projects would push EUETS prices up most significantly of other options. Move from base EU allowance price of €16 to €42.	developing world. As above, this incentivises more CDM investment, but allows access to all project types, so does not focus on directing demand to the more valuable CDM projects in renewable electricity or heat.	As above, attractive from the point of view of (i) flexibility that could be added to national or EU measures (ii) lowest costs of all options. However this could be seen to water down the renewable target a step too far given basis on GHG and non- EU. Might be acceptable with some limits. Overall a good option if we want to start by arguing for maximum flexibility on all fronts.
Use EU ETS as equivalent reductions in GHG	€19.5bn	Yes- adding significant additional demand in the market causes price to jump upwards. Move from base EU allowance price of €16 to €40.	Depending on how much CDM is allowed into the EU ETS market, this will have an indirect impact on stimulating demand for all CDM projects.	Attractive from the point of view of supporting the EU ETS directly, good reduction in costs and possibly some indirect incentives for CDM. However, the Commission and some member states may strongly resist on the grounds that this re-interprets the renewables directive as a GHG only instrument, and risks too high a price in the EU ETS market. May be acceptable with some limits.
Allow for use of additional tariffs	Depends on how penalty levels are set. Could be above or below €24 billion.	No direct impacts.	No direct impacts.	Could be used as a route to have a stand alone 'buy-out' system with national only approaches and therefore keep costs down. Useful for negotiating the acceptability GHG equivalent measures if they are added on.