

# Chapter 3: Emissions reduction scenarios and indicators

In our December report we set out a range of emissions reduction scenarios based on alternative assumptions about Government commitment and policy effort. We showed that there were feasible scenarios for meeting our proposed carbon budgets. In particular, the Government's policies and commitments at the time were sufficient, if successfully implemented, to meet the Interim budget without purchase of offset credits; new commitments would be required to meet the Intended budget through domestic emissions reductions.

In this chapter we set out revised scenarios which reflect:

- New analysis of emissions reduction potential. For example, we have carried out new analysis of the pace at which energy efficiency measures can be feasibly rolled out, and of the scope for emissions reductions through renewable heat.
- New commitments by the Government since the December report was published. Two areas where notable commitments have been made are to try to promote widespread insulation of solid walls and to introduce new policies to tackle emissions reduction potential in agriculture.

The chapter also includes a new framework we will use to monitor progress in meeting carbon budgets. This includes emissions trajectories, not only emissions but also implementation of measures to reduce emissions and the policies required to achieve this.

We argue in the chapter that tracking emissions alone would not be an adequate basis for fulfilling our statutory duty to monitor progress in meeting carbon budgets. This is because there are a number of factors which drive emissions year on year, not all of which would result in sustainable emissions reductions. It is also because many of the measures needed to reduce emissions have long project lead times. Failure to track progress

according to different stages of the project cycle could result in a situation where it becomes clear far too late that measures are not being implemented as required.

We therefore complement our emissions reduction scenarios with a set of indicators of progress towards achieving a commensurate level of emissions reduction, including policy milestones and high level incentives that the policy framework should provide.

The main messages in the chapter are:

- Our revised emissions reduction scenarios continue to meet the Interim budget without the need for purchase of offset credits. Meeting the Intended budget would require new commitments from Government or purchase of offset credits.
- The framework of indicators and forward indicators that we set out should not be seen as a concrete plan for meeting budgets which cannot be deviated from. Rather, we envisage a situation where there may be underperformance on some measures and outperformance on others which would on average leave emissions on track to achieve budgets. Our indicators would be useful, however, in highlighting situations where a sufficiently large number of measures are off track that we can no longer be confident that budgets will be achieved. If such situations were to arise, the Committee would then propose remedial measures.
- Policies set out in the UK Low Carbon Transition Plan provide a good foundation for cutting emissions and achieving budgets. It is the Committee's view, however, that there are significant risks for meeting the second and third budgets under the existing framework, and that policy strengthening is required across the power, buildings and industry, and transport sectors.



The chapter is structured in four sections:

1. Revised emissions reduction scenarios
2. The framework for monitoring budgets: indicators and forward indicators
3. Summary of measures to deliver budgets
4. Summary of required policy strengthening to deliver budgets.

It does not include indicators for agriculture or other non-CO<sub>2</sub> gases. It is the Committee's intention to set out a detailed assessment of agriculture emissions in the next progress report to Parliament due in June 2010.

## 1. Revised emissions reduction scenarios

### Emissions reduction scenarios in the December report

In our December report we set out three emissions reduction scenarios which we constructed using a reference emissions projection from which we netted off emissions reductions due to implementation of measures:

- The **Current Ambition** scenario included identified measures that would cost less per tonne than our projected carbon price, and/or which are covered by policies already in place. It also included significant progress towards low-carbon electricity generation and some progress on improving fuel efficiency in new cars. Some policy strengthening would be required to deliver the Current Ambition scenario.
- The **Extended Ambition** scenario incorporated more ambitious but still reasonable assumptions on penetration of energy efficiency improvements and a number of measures which would cost more per tonne than our projected carbon price, but which are important stepping stones on the path to 2050. It was broadly in line with policies to which the Government is committed in principle, but where precise definition and implementation of policy is required. It included, for instance, a significant penetration of renewable heat, more ambitious energy efficiency improvement in cars and some lifestyle changes in home and transport.

Delivery of the Extended Ambition would require both strengthening of existing policies and introduction of new policies.

- The **Stretch Ambition** scenario added further feasible abatement opportunities for which no policy commitment was in place, including emissions reduction potential in agriculture, more radical new technology deployment and more significant lifestyle adjustments.

We showed that the Extended and Stretch Ambition scenarios would achieve the non-traded sector Interim budget without the need to purchase offset credits, and the Stretch Ambition scenario would be almost sufficient to achieve the Intended budget. In the traded sector, the Extended and Stretch Ambition scenarios would largely achieve the Interim budget, with the purchase of European Union Allowances (EUAs) from other member states required to meet the Intended budget.

### Updated emissions reduction scenarios

We have subsequently revised our scenarios to reflect new reference emissions projections (see Chapter 2), new analysis and new commitments by the Government (Table 3.1). In doing this, we have focused on Extended and Stretch Ambition scenarios, given that the Current Ambition scenario is not sufficiently ambitious to meet budgets, and that Government commitments for measures in the Extended Ambition scenario are closer to becoming policy.

Our new Extended Ambition scenario reflects two main categories of change relative to our December 2008 report:

- The Government has made new commitments (e.g. solid wall insulation)
- Our estimates of emissions reduction potential for existing commitments have changed based on new analysis (e.g. renewable heat).

### Updates based on new Government commitments:

- We argued in our December report that there is a significant opportunity for cost effective emissions reduction through solid wall insulation.

We noted, however, that this may be politically difficult to achieve at scale given the disruption which installing solid wall insulation may cause to households. However, in its Heat and Energy Saving consultation, the Government has, suggested that out of 7 million homes receiving a 'whole house package' by 2020, 2 million will be 'hard to treat' homes. We therefore assume that 2 million houses have solid wall insulation by 2020 with a corresponding emissions reduction of 2.7 MtCO<sub>2</sub>.

- We previously suggested that there is significant scope for agricultural emissions reduction, but included these in our Stretch rather than Extended Ambition scenario given uncertainties over the precise order of magnitude of potential and the absence of a policy framework. More recently, the Government included agricultural emissions reductions in its scenarios set out in the Low Carbon Transition Plan, and committed to introduce a policy framework to unlock emissions reduction potential. We therefore include emissions reduction of 3.3 MtCO<sub>2</sub> in our Extended Ambition scenario, which is consistent with the Government's estimate in its central scenario.
- Similarly, in our December report, we included emissions reduction from waste management only in our Stretch Ambition scenario. Consistent with the central scenario set out more recently in the Government's Low Carbon Transition Plan, we now include 0.6 MtCO<sub>2</sub> in our Extended Ambition scenario.

#### *Updates based on new analysis*

- We have revised emissions reduction trajectories to reflect more detailed analysis over the feasible pace at which measures can be implemented. In the residential buildings sector, for example, where we had previously assumed a straight line emissions trajectory through the first three budget periods, we now assume faster implementation of loft and cavity wall insulation.
- Based on new analysis of renewable heat, we have adjusted our estimate of feasible emissions reduction from renewable heat from 12 MtCO<sub>2</sub> to 18 MtCO<sub>2</sub> in 2020. This is broadly in line with the Government's Renewable Energy Strategy.

In addition, the Committee has changed its judgement on the issue of speed limit enforcement: it is reasonable to enforce the existing 70 mph speed limit and this is also feasible given average speed controls and in-car speed limiting devices. We have therefore included emissions reduction of 1.4 MtCO<sub>2</sub> in our Extended Ambition scenario to reflect enforcement of the 70 mph speed limit.

In total, these changes result in an Extended Ambition scenario which offers an additional 10 MtCO<sub>2</sub> emissions reduction potential in 2020 than the same scenario in our December 2008 report.

Our Stretch Ambition scenario is updated in the following ways:

- We noted in our December 2008 report potential for a 2 MtCO<sub>2</sub> emissions reduction from early replacement of old inefficient boilers. We did not include this in either our Extended or Stretch Ambition scenario, however, given that there was no clear policy lever to provide incentives for early replacement. We argue in Chapter 5 that early replacement could be included in a whole house approach to energy and carbon efficiency improvement in the residential sector. We therefore include emissions reduction of 1.7 MtCO<sub>2</sub> in 2020 from early replacement of boilers in our revised Stretch Ambition scenario.
- Based on new analysis of road pricing, we estimate that emissions reductions of 5.6 MtCO<sub>2</sub> in 2020 are available. Good economic rationale exists for introducing road pricing; however we include this in our Stretch rather than Extended Ambition scenario reflecting the political judgements to be made.

With these changes, our Stretch Ambition scenario offers an additional 14 MtCO<sub>2</sub> emissions reduction in 2020 relative to the Extended Ambition scenario.

**Table 3.1** Revisions to Extended and Stretch Ambition scenarios

	Extended Ambition			Stretch Ambition		
	Abatement potential in 2020 (MtCO <sub>2</sub> )		Reason for change	Abatement potential in 2020 (MtCO <sub>2</sub> )		Reason for change
	Dec 2008 Report	This Report		Dec 2008 Report	This Report	
Domestic buildings						
Cavity wall, solid wall and loft insulation	4	6	reflects latest government targets	7	8	reflects latest government targets
Other Insulation Measures	2	1	new estimates of take-up	2	1	new estimates of take-up
Heating Efficiency	<1	<1	new estimates of take-up	<1	2	new estimates of take-up
Lights and appliances	5	5	new estimates of take-up	5	6	new estimates of take-up
Lifestyle measures	4	4	unchanged	4	4	unchanged
Zero carbon homes	4	1	revised government estimate	4	1	revised government estimate
Total	19	17		22	22	
Non-domestic buildings and industry						
Total	16	16	unchanged	16	16	unchanged
Renewable heat						
Total	12	18	revised estimates of savings based on work by NERA, in line with RES	15	18	revised estimates of savings based on work by NERA, in line with RES
Road transport						
Biofuels	5	5	revised vehicle-km forecasts	5	5	revised vehicle-km forecasts
Car technology	10	10	revised vehicle-km forecasts, less aggressive uptake of EV and PHEVs	10	10	revised vehicle-km forecasts, less aggressive uptake of EV and PHEVs
Van technology	1	2	revised vehicle-km forecasts, now includes EV and PHEV technology	3	2	revised vehicle-km forecasts
HGV technology	1	1	revised vehicle-km forecasts	1	1	revised vehicle-km forecasts

**Table 3.1** continued

	Extended Ambition			Stretch Ambition		
	Abatement potential in 2020 (MtCO <sub>2</sub> )		Reason for change	Abatement potential in 2020 (MtCO <sub>2</sub> )		Reason for change
	Dec 2008 Report	This Report		Dec 2008 Report	This Report	
Rail – efficiency measures	1	1	unchanged	1	1	unchanged
Demand – Smarter Choices	3	3	unchanged	3	3	unchanged
Demand – Eco driving – cars	<1	<1	unchanged	1	1	unchanged
Demand – Eco driving – vans and HGVs	1	1	unchanged	1	1	unchanged
Speed limiting (at 70 mph in Extended, 60 mph in Stretch)		1	not included last year	5	3	new information on split of travel across different road types
Road pricing					6	not included last year
<b>Total</b>	<b>22</b>	<b>23</b>		<b>30</b>	<b>32</b>	
<b>Agriculture</b>						
Total		3	not included last year, now reflects government commitment		3	not included last year, now reflects government commitment
<b>Waste</b>						
Total		1	not included last year, now reflects government commitment		1	not included last year, now reflects government commitment
<b>Total</b>	<b>69</b>	<b>79</b>		<b>83</b>	<b>92</b>	

Note: Due to rounding, small changes may not be apparent and figures may not sum to totals.

### Comparison of updated scenarios with carbon budgets

Non-traded sector emissions under the Extended Ambition scenario are 11 MtCO<sub>2</sub> lower in 2020 compared to the same scenario in the December 2008 report.

Our updated Extended Ambition scenario continues therefore to offer sufficient emissions reduction potential to meet the non-traded sector Interim budget without the need for purchase of offset credits (Figure 3.1), but not the Intended budget.

However, our updated Stretch Ambition scenario does meet the Intended budget in the non-traded sector through domestic effort alone for all years except 2022.

Moving from the Interim to the Intended budget would require either additional commitment from Government or purchase of offset credits.

The Committee will advise on the appropriate level of offset credit purchase as part of our wider advice on moving to the Intended budget once a deal to reduce global emissions has been agreed.

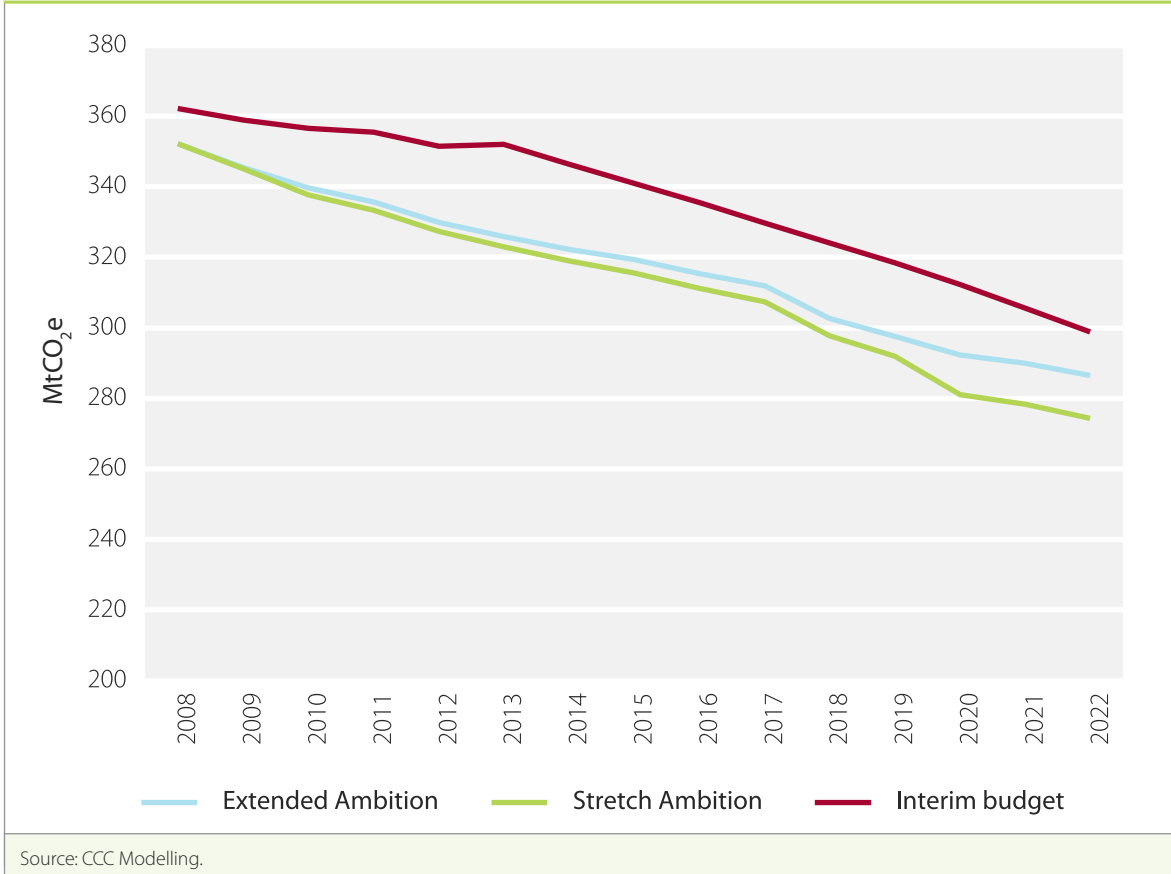
In the traded sector our Extended and Stretch Ambition scenarios offer similar levels of emissions reduction potential as in our December 2008 report. At the same time, our assumptions about coal build in the power sector have been updated with the result that traded sector emissions are now lower. Overall, our Extended and Stretch Ambition scenarios continue to allow the traded sector Interim budget to be met domestically; the Intended budget would not be met though domestic effort alone.

### Comparison of revised scenarios with official projections

Economy wide emissions under our Extended Ambition scenario are 24 MtCO<sub>2</sub>e lower in 2020 compared with the government's central projection. Non-traded sector emissions are 9 MtCO<sub>2</sub>e, reflecting different assumptions that we have made about the level of emissions reduction that would be delivered through effective policy (Box 3.1)<sup>1</sup>. We therefore recommend that the Government's level of policy ambition should be increased to reflect our bottom up analysis of emissions reduction potential (e.g. in industry and transport). In order to deliver this ambition, strong incentives will be required to support uptake of measures; we discuss required policy strengthening in Section 4 below and in Chapters 4-6.

<sup>1</sup> Our traded sector emissions are lower for two reasons: we have a slightly different split of emissions between the traded and non-traded sectors (chapter 2); we have also assumed a slightly different capacity/generation mix (chapter 4).

**Figure 3.1** Emissions trajectories under the Extended and Stretch Ambition trajectories for the non-traded sector versus budget



### Box 3.1 Comparison of CCC and Government scenarios for emissions reduction

In 2020, measures in our Extended Ambition scenario save 14 MtCO<sub>2</sub> more, and in our Stretch Ambition scenario 27 MtCO<sub>2</sub> more, than the Government's central scenario.

In the Extended Ambition scenario this principally reflects:

Buildings and industry (Table B3.1.a)

- A similar level of ambition for domestic buildings
- Higher savings from the commercial and industrial sectors, where we envisage wider roll

out of EPCs and DEC, development of a policy framework to deliver increased savings from SMEs and use of existing policy (EU ETS, CCAs and CRC) to deliver all cost-effective potential

Surface transport (see table)

- Greater ambition for delivery of savings from new cars on track to average new car emissions in the UK of 95 gCO<sub>2</sub>/km
- Wider roll out of Smarter Choices to towns and cities in the UK
- Enforcement of the 70 mph speed limit

Our ambitions for power sector decarbonisation are similar.



## Box 3.1 continued

Table B3.1.a: Comparison of CCC and government emissions trajectories

Measure	Abatement potential in 2020 (MtCO <sub>2</sub> e)									
	CCC						Government			
	Extended Ambition scenario			Stretch Ambition scenario			Included in UK Low Carbon Transition Plan			Additional savings identified*
	Non-traded	Traded	Total	Non-traded	Traded	Total	Non-traded	Traded	Total	Total
<b>Buildings &amp; industry</b>										
Measures excluding renewable heat										
Domestic			17			22			18	
Public			2			2			1	
Commercial			7			7			6	
Industry			6			6			3	
CHP			1			1				
TOTAL	15	18	33	18	20	38	10	17	28	
Renewable heat										
TOTAL	13	5	18	13	5	18	10	5	15	
<b>Surface transport</b>										
Biofuels			5			5			7	
Car technology			10			10			8	
Van technology			2			2			2	
HGV technology			1			1			<1	
Rail efficiency measures			1			1			<1	
Bus technology									<1	
Smarter Choices			3			3				1
Eco driving - cars, vans and HGVs			1			2				<1
SAFED for bus drivers									<1	
Speed limiting			1			3				1
Road pricing						6				
TOTAL	24	-1	23	33	-1	32	18	-1	18	3
<b>Agriculture &amp; Waste</b>										
TOTAL	4		4	4		4	4		4	
GRAND TOTAL	56	22	79	67	24	92	42	22	64	3

\*Additional savings identified by Government but not included in the Transition Plan

## 2. The framework for monitoring budgets: indicators and forward indicators

We have demonstrated that successful delivery of our emissions reduction scenarios would achieve the UK's carbon budgets. One approach to monitoring progress would simply be to compare actual emissions with budgets and to say that we are on track if emissions are within budgeted levels, and off track otherwise. We do not, however, accept this approach for two reasons:

- There are many factors which drive emissions, some of which would not result in sustainable emissions reductions. It may be the case, for example, that emissions in a particular year are low due to a mild winter, but that emissions in subsequent years are higher as winters are colder. A current example relates to the economic recession, which will result in falling emissions and may give the impression that we are on track to meet carbon budgets even though there is limited progress on implementation of measures that will be required to meet the second and third budgets; we set out detailed analysis of this issue in Chapter 2.
- Some of the measures which will result in emissions reductions have long lead times (e.g. investment in low carbon power generation); focusing simply on emissions could reveal too late that measures required to meet budgets have not been implemented.

The Committee will therefore fulfil its statutory obligation to monitor progress meeting budgets by considering both emissions and indicators of progress in implementing measures that drive emissions reductions.

In developing our indicators, we have considered various existing indicator frameworks, both generally and in the specific context of climate change (Box 3.2). This has informed our framework, which includes emissions, drivers of emissions, forward indicators for these drivers where appropriate, policy milestones, and contextual factors (Figure 3.2):

### Headline indicators

- **Emissions.** Our headline indicators include a sectoral breakdown of economy wide emissions to power, buildings and industry, transport.
- **Emissions intensity and demand.** They also include high level indicators of the supply and demand side factors which drive emissions. On the supply side, for example, we have developed trajectories for carbon intensity of power generation and carbon efficiency of vehicles underpinning our emissions reduction scenarios. On the demand side, we have trajectories for electricity and heat demand reduction, and for vehicle miles/passenger miles.

### Supporting indicators

- **Implementation indicators.** Each headline indicator is underpinned by a set of indicators which track progress in implementing the measures required to achieve sustainable emissions reduction. We have therefore developed trajectories across the range of measures driving our emissions reduction scenarios. In the power sector, for example, we have trajectories for adding low-carbon power generation capacity. In buildings we have trajectories for roll out of loft, cavity wall and solid wall insulation. In cars, we have trajectories for penetration of electric cars.
- **Forward indicators.** Where appropriate, we have trajectories for forward indicators that we will use to assess whether we are on track to deliver measures as required. In the power sector, for example, delivering the new low-carbon capacity required will require planning applications/decisions to be made, projects to move to the construction phase, etc., a number of years before emissions reductions ensue.
- **Policy milestones.** In order that measures are successfully implemented, the appropriate enabling framework will have to be in place. We therefore include in our framework indicators reflecting key policy milestones and high level aspects of policy design.

### Box 3.2 Existing indicator frameworks

Performance information is the information used to measure an organisation's progress towards its objectives. Financial ratios have long been used to measure performance in the private sector. Public sector performance indicators tend to differ – the aims of Government are wider than private organisations, reflected in a wider range of performance measures.

#### Some established performance frameworks

##### HM Treasury's 'Choosing the Right Fabric'

HM Treasury publish guidance to departments setting out general principles for producing high quality performance information<sup>1</sup>.

This recognises that defining performance measures, setting targets and collecting performance information requires a balance between using the ideal information and using what is possible, available, affordable, and most appropriate to the particular circumstances.

It also recognises that while, ultimately, organisations aim to improve outcomes, measurement can be difficult. Moreover, it is useful to understand how inputs and outputs and associated processes are contributing to outcomes. Hence performance measures need to look at inputs and outputs as well. It's also important to look at performance in context, establishing factors external to Government that affect an outcome.

#### Logical Frameworks

Logical Frameworks ('logframes') are widely used by development organisations to help strengthen activity design, implementation and evaluation. Guidance is provided by DfID as part of their Tools for Development<sup>2</sup>. Indicators play a crucial role in logframe planning and analysis:

- They specify realistic targets
- They provide the basis for monitoring, review and evaluation
- The process of setting indicators contributes to transparency.

#### Existing climate change mitigation indicators

A range of climate change mitigation indicators exist.

#### Government PSAs

Public Service Agreements (PSAs) set out the key outcomes that Government wants to achieve in the next spending period. PSA 27 sets out Government's aim to 'Lead the global effort to avoid dangerous climate change'<sup>3</sup> and is underpinned by six outcome-focused indicators. Two – UK greenhouse gas and CO<sub>2</sub> emissions, and Greenhouse gas and CO<sub>2</sub> intensity of the UK economy – are the most relevant to the Committee's task to monitor progress towards decarbonisation, although published with a lag.

1 HM Treasury, Cabinet Office, National Audit Office, Audit Commission, Office For National Statistics (2001) Choosing the Right FABRIC – A Framework For Performance information. <http://www.hm-treasury.gov.uk/d/229.pdf>

2 DfID (2003) Tools for Development – A handbook for those engaged in development activity <http://www2.dfid.gov.uk/pubs/files/toolsfordevelopment.pdf>

3 HM Government (2007) PSA Delivery Agreement 27: Lead the global effort to avoid dangerous climate change. [http://www.hm-treasury.gov.uk/d/pbr\\_csr07\\_psa27.pdf](http://www.hm-treasury.gov.uk/d/pbr_csr07_psa27.pdf)

### Box 3.2 continued

#### Departmental Strategic Objectives

Government PSAs are underpinned by Departmental Strategic Objectives (DSOs)<sup>4</sup>. These have their own indicators which include some of the drivers of emissions, for example proportion of electricity from renewable sources, average new car CO<sub>2</sub> emissions and annual energy saving from domestic appliance design.

#### Other Government monitoring data

Other government indicator sets monitor changes in factors relevant to climate change but do not define in detail what success should look like. These include the Government's Sustainable Development Indicators<sup>5</sup> and the UK Energy Sector Indicators published by DECC<sup>6</sup>.

#### Indicators used by the European Commission

The European Commission publish a range of indicators – both for the EU as whole and the individual member states – largely derived from GHG or CO<sub>2</sub> emission statistics<sup>7</sup>. Whilst they capture a wider range of emissions and provide more sector detail than the emissions indicators underpinning the UK's PSA 27, these indicators suffer from the same publication lags.

As part of the EU Energy End-Use Efficiency and Energy Services directive, member states will also be required wherever practicable to measure, verify and report their total energy savings using a harmonised framework which includes a range of energy efficiency indicators<sup>8</sup>.

#### Roadmaps for climate change mitigation

##### CBI

In April 2009, the CBI set published a set of roadmaps to a low-carbon future for each sector of the economy<sup>9</sup>. Covering both policy and market response, they identified key steps necessary over the next 10 years to drive a 'green' economic recovery, decarbonise the UK economy and secure business buy-in and investment.

##### HM Government

The UK Low Carbon Transition Plan included a roadmap for building a low-carbon UK. It set out the Government's plan for reducing emissions and meeting carbon budgets, summarised in a set of timelines for each sector showing the major changes over the next 10 years.

The steps identified in these roadmaps provide milestones and indicators of progress.

4 Defra (2009) Departmental Report 2009. <http://www.defra.gov.uk/corporate/about/how/dep/depdocs/2009-depreport.pdf>, DECC (2009) Annual Report and Resource Accounts 2008-09. [http://www.decc.gov.uk/en/content/cms/publications/annual\\_reports/2009/2009.aspx](http://www.decc.gov.uk/en/content/cms/publications/annual_reports/2009/2009.aspx), DfT (2009) Annual Report and Resource Accounts 2008-09. <http://www.dft.gov.uk/about/publications/apr/ar2009/arra.pdf>

5 See <http://www.defra.gov.uk/sustainable/government/progress/index.htm>

6 See <http://www.decc.gov.uk/en/content/cms/statistics/publications/indicators/indicators.aspx>

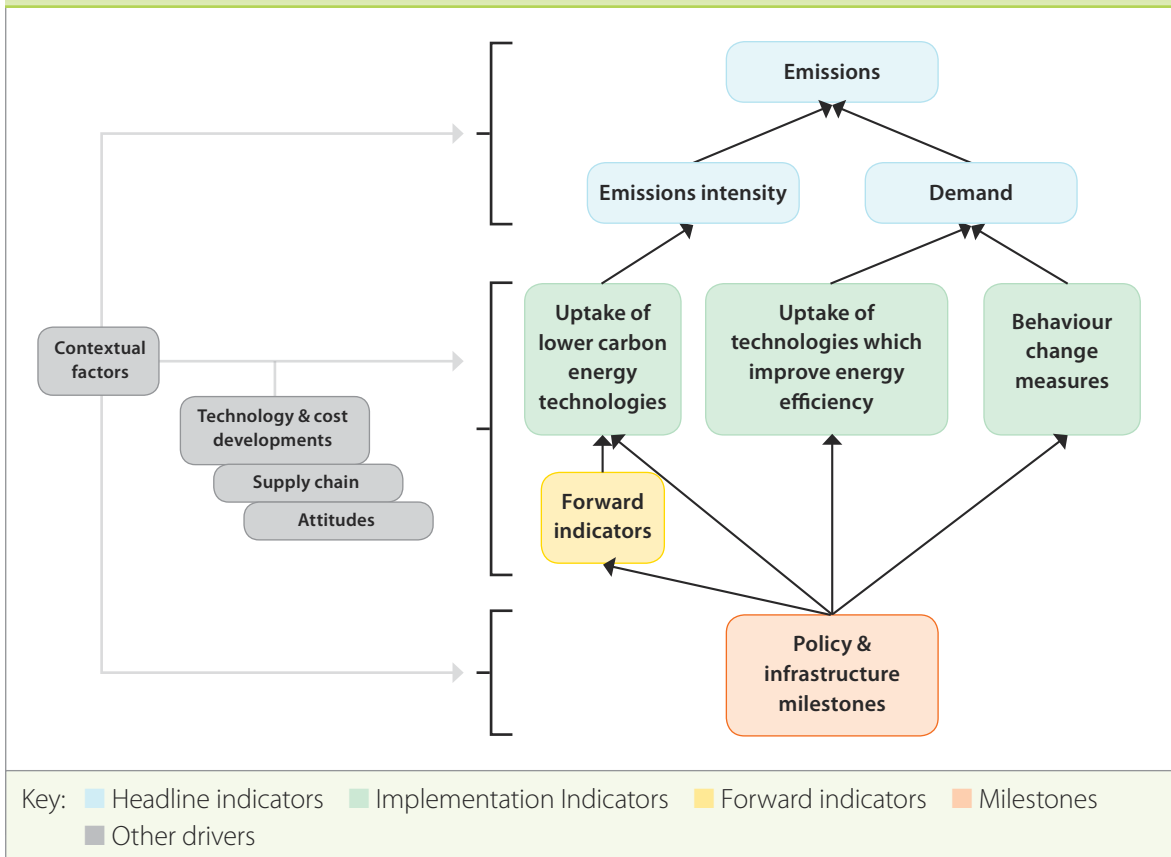
7 See for example [http://ec.europa.eu/energy/publications/doc/statistics/part\\_4\\_energy\\_pocket\\_book\\_2009.pdf](http://ec.europa.eu/energy/publications/doc/statistics/part_4_energy_pocket_book_2009.pdf)

8 See [http://eur-lex.europa.eu/smartapi/cgi/sga\\_doc?smartapi!celexplus!prod!CELEXnumdoc&lg=EN&numdoc=32006L0032](http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexplus!prod!CELEXnumdoc&lg=EN&numdoc=32006L0032)

9 CBI (2009) Going the distance: the low-carbon economy roadmap.

[http://climatechange.cbi.org.uk/uploaded/Roadmap\\_SummaryDistance.pdf](http://climatechange.cbi.org.uk/uploaded/Roadmap_SummaryDistance.pdf)

**Figure 3.2 The CCC indicator framework**



**Other drivers**

There are a number of emissions drivers for which we do not set out indicators in advance but which we will track as part of our monitoring framework. These include drivers for which we would hope to see improvements (e.g. technology costs, supply chain capability etc.) and those which are purely contextual (e.g. GDP, fossil fuel prices, population etc.).

In choosing indicators, we have required that these fulfil a range of criteria. In particular, high quality representative data must be available in timely manner if it is to be useful for monitoring. Where data is not available or does not meet these criteria, we will work with Government to try to address this.

In using indicators, the Committee wishes to make clear that our framework provides an indicative roadmap for emissions reduction rather than a concrete plan which cannot be

deviated from. It may be the case, for example, that some indicators are not met, but that there is a good reason for this (e.g. because battery costs for electric cars do not fall as quickly as we envisage), and that there is more achieved on take up of more carbon efficient cars based on conventional technology. The Committee will therefore apply the framework in a pragmatic manner that allows for emission reductions to be lower in some cases and higher in other cases than currently envisaged.

It would not be acceptable, however, to be off track across a range of measures without compensating with outperformance on other measures. If this were to ensue, the Committee would explore scope for remedial actions. The indicator framework is therefore a tool for supporting analysis and assessing progress in meeting carbon budgets and for underpinning an evolving strategy to achieve carbon budgets.



### 3. Summary of measures to deliver budgets

In this section we provide a summary of our indicators based on our Extended Ambition scenario, for the power sector, buildings and industry and transport; more detailed analysis of these sectors is set out in Chapters 4-6.

#### Power sector indicators

Power sector indicators include trajectories for emissions, carbon intensity of power generation, investment in low-carbon power generation, and actions required in order that investment proceeds (Table 3.2):

- Our emissions trajectory results in a 53% reduction in emissions by 2020 through retirement of existing coal plant and investment in renewable (primarily wind), nuclear and CCS coal generation.
- Carbon intensity along this trajectory falls from the current average of 540 g/kWh to around 300 g/kWh in 2020.
- Low-carbon generation capacity comprising 27.1 GW total wind, two additional nuclear plants and up to four CCS coal plants, is required to drive this trajectory.
- Forward indicators for delivery of this investment include planning applications/decisions and entry of plant into construction. For example, in order that onshore wind plant comes onto the system in 2020, this must have entered planning two years earlier (three years earlier for offshore) and construction one year earlier (two years earlier for offshore); for nuclear plant, planning project development should start with a seven year lead relative to when capacity is required on the system; etc..

**Table 3.2** Power sector indicators

Power	Budget 1	Budget 2	Budget 3	
<b>Headline indicators</b>				
<i>Emissions intensity (g/kWh)</i>	509	390	236	
<i>Total emissions (% change from 2007)</i>	-15%	-39%	-64%	
<i>Generation (TWh)</i>	<i>Wind</i>	21	50	98
	<i>Nuclear</i>	58	30	48
	<i>CCS</i>	0	5	11
<b>Supporting indicators</b>				
<b>Transmission</b>				
<i>Agreement on incentives for anticipatory investment for Stage 1 reinforcements</i>	2010			
<i>Implementation of enduring regime for accessing grid</i>	2010			
<i>Transitional OFTO regime in place</i>	2009			
<i>Enduring OFTO regime in place</i>	2010			

<b>Table 3.2 continued</b>					
<b>Power</b>		<b>Budget 1</b>	<b>Budget 2</b>	<b>Budget 3</b>	
<i>Grid reinforcement planning approval</i>		2011: Scotland Stage 1, Wales Stage 1 (Central), South East	2013: Wales Stage 1 (North), English East Coast Stage 1, South West 2014: Scotland Stage 2		
<i>Grid reinforcement construction begins</i>		2012: Scotland Stage 1, Wales Stage 1 (Central), South East	2014: Wales Stage 1 (North), English East Coast Stage 1, South West 2015: Scotland Stage 2		
<i>Grid reinforcements operational</i>			2015: Scotland Stage 1, Wales Stage 1 (Central), South East  2017: Wales Stage 1 (North), English East Coast Stage 1, South West	2018: Scotland Stage 2	
<i>Tendering for first offshore connections under enduring OFTO regime</i>		2010			
<i>Construction of first offshore connections under enduring OFTO regime begins</i>		2011			
<i>First offshore connections under enduring OFTO regime operational</i>		2012			
<b>Planning</b>					
<i>IPC set up and ready to receive applications</i>		2010			
<b>Market</b>					
<i>Review of current market arrangements and interventions to support low-cost, low-carbon generation investment</i>		to begin in first budget period			
<b>Wind</b>					
<i>Generation (TWh)</i>	<i>Onshore</i>	13	26	44	
	<i>Offshore</i>	8	24	54	
<i>Total capacity (GW)</i>	<i>Onshore</i>	5.7	10.8	18.0	
	<i>Offshore</i>	2.5	7.4	16.6	

Table 3.2 continued

Power		Budget 1	Budget 2	Budget 3
Capacity entering construction (GW)	Onshore	0.9	1.3	1.5
	Offshore	0.9	1.6	2.6
Capacity entering planning	Onshore	New planning applications will be required from the end of the second budget period at the latest to maintain flow into construction		
	Offshore	New planning applications will be expected in line with site leasing		
Average planning period (months)		<12	<12	<12
<b>Nuclear</b>				
Regulatory Justification process		2010		
Generic Design Assessment		2011		
National Policy Statement for nuclear (including Strategic Siting Assessment)		2010		
Regulations for a Funded Decommissioning Programme in place		2010		
Entering planning		first planning application in 2010	subsequent applications at 18 month intervals	
Planning approval; site development and preliminary works begin		first approval and site development and preliminary works begin in 2011	subsequent application approvals, site development and preliminary works at 18 month intervals	
Construction begins			first plant in 2013, subsequent plants at 18 month intervals	
Plant begins operation				first plant in 2018, with subsequent plants at 18 month intervals*
<b>CCS</b>				
Front-End Engineering and Design (FEED) studies for competition contenders completed		2010		
Announce competition winner		2010		

<b>Table 3.2 continued</b>			
<b>Power</b>	<b>Budget 1</b>	<b>Budget 2</b>	<b>Budget 3</b>
<i>Second demonstration competition</i>	launch 2010, announce winners 2011		
<i>Quantification of saline aquifer CO<sub>2</sub> storage potential</i>		no later than 2015	
<i>Review of technology and decision on framework for future support</i>		no later than 2016	
<i>Strategic plan for infrastructure development</i>		no later than 2016	
<i>Planning and authorisation approval, land acquisition, and storage site testing completed, construction commences</i>	first demo in 2011	subsequent demos 2012/13	
<i>Demonstrations operational</i>		first demo in 2014, subsequent demos 2015/16**	
<i>First new full CCS plants supported via the 2016 mechanism</i>			2022
<b>Other drivers</b>			
<i>Total demand (TWh), coal and gas prices, nuclear outages</i>			
<i>Average wind load factors, availability of offshore installation vessels, access to turbines</i>			
<i>Nuclear supply chain, availability of skilled staff</i>			
<i>International progress on CCS demonstration and deployment</i>			
<i>Planning approval rates and frequency of public inquiries to decisions of Infrastructure Planning Commission</i>			

\* Up to 3 nuclear plants by 2022.

\*\* Up to 4 CCS demonstration plants by 2020.

Note: Numbers indicate amount in last year of budget period i.e. 2012, 2017, 2022

Key:

■ Headline indicators ■ Implementation indicators ■ Forward indicators ■ Milestones ■ Other drivers

### Buildings and industry indicators

Indicators for buildings and industry include emissions trajectories for residential buildings, non-residential buildings and industry, measures to improve energy efficiency, and increased penetration of renewable heat (Table 3.3):

- Our emissions trajectory for residential buildings has total emissions falling by 29% over the period to 2020, with a 20% reduction in direct emissions and a 53% reduction in indirect (i.e. electricity-related) emissions
- Residential energy demand along this trajectory falls by 16% by 2020.
- Energy efficiency improvement includes insulation of 90% lofts and cavity walls by 2015, with solid wall insulation in around 2 million houses by 2020, and boiler replacement in up to 11 million houses.
- Penetration of renewable heat reaches 12% of total heat supply by 2020 resulting in emissions reduction of 18 MtCO<sub>2</sub>.
- In the period to 2020, emissions fall by 28% for non-residential buildings and by 16% for industry, underpinned by reductions in energy demand of 7% and 16% respectively.
- All cost-effective emissions reduction potential for public sector buildings covered by the CRC is realised by 2018.



<b>Table 3.3 Buildings and industry indicators</b>				
<b>Buildings and Industry</b>		<b>Budget 1</b>	<b>Budget 2</b>	<b>Budget 3</b>
<b>All buildings and industry</b>				
<b>Headline indicators</b>				
<i>CO<sub>2</sub> emissions (% change on 2007)*</i>	<i>direct</i>	-9%	-11%	-15%
	<i>indirect**</i>	-11%	-28%	-58%
<i>Final energy consumption (% change on 2007)</i>	<i>non-electricity</i>	-10%	-18%	-23%
	<i>electricity (centrally produced)***</i>	-8% (-4%)	-7% (-9%)	-5% (-13%)
<b>Residential buildings</b>				
<b>Headline indicators</b>				
<i>CO<sub>2</sub> emissions (indicative minimum % change on 2007)*</i>	<i>direct</i>	-6%	-18%	-20%
	<i>indirect**</i>	-11%	-23%	-53%
<i>Final energy consumption (indicative minimum % change on 2007)</i>	<i>non-electricity</i>	-6%	-18%	-19%
	<i>electricity (centrally produced)***</i>	-5% (-5%)	-4% (-4%)	-3% (-3%)
<b>Supporting indicators</b>				
<i>Uptake of Solid Wall insulation (million homes, total additional installations compared to 2007 levels)</i>		0.5	1.2	2.3
<i>Uptake of Loft insulation (up to and including 100mm) (million homes, total additional installations compared to 2007 levels)</i>		2.1	5.3	5.3
<i>Uptake of Loft insulation (100mm +) (million homes, total additional installations compared to 2007 levels)</i>		1.9	4.8	4.8
<i>Uptake of Cavity wall insulation (million homes, total additional installations compared to 2007 levels)</i>		3.5	7.5	7.5
<i>Uptake of Energy efficient boilers (million homes, total additional installations compared to 2007 levels)</i>		4.9	9	12
<i>Uptake of Energy efficient appliances - Cold A++ rated (% of stock)</i>		3%	18%	45%
<i>Uptake of Energy efficient appliances - Wet A+ Rated (% of stock)</i>		22%	53%	82%
<i>Every house offered whole-house energy audit</i>			by 2017	

<b>Table 3.3 continued</b>				
<b>Buildings and Industry</b>		<b>Budget 1</b>	<b>Budget 2</b>	<b>Budget 3</b>
<i>Heat and Energy Saving Strategy finalised</i>		2009		
<i>New financing mechanism pilots operate and are evaluated</i>		2011		
<i>Post CERT delivery framework legislation in place</i>		2011		
<b>Other drivers</b>				
<i>Average SAP rating, Implementation of behavioural measures, Population (by age), Number of households (by type - building and occupants), Household disposable income, Electricity and gas prices, Appliance ownership</i>				
<b>Non-residential buildings</b>				
<b>Headline indicators</b>				
<i>CO<sub>2</sub> emissions (indicative minimum % change on 2007)*</i>	<i>direct</i>	6%	2%	-3%
	<i>indirect**</i>	-9%	-22%	-51%
<i>Final energy consumption (indicative minimum % change on 2007)</i>	<i>non-electricity</i>	-4%	-8%	-13%
	<i>electricity (centrally produced)***</i>	-1% (-1%)	-1% (-1%)	-1% (-1%)
<b>Supporting indicators</b>				
<i>Develop policy on SMEs</i>		by October 2010		
<i>Government decision on the following recommendations for EPCs and DECs:</i>		by October 2010		
<i>· All non-residential buildings to have an EPC</i>			by 2017	
<i>· All non-residential buildings to have a minimum EPC rating of F or higher</i>				by 2020
<i>· Roll out of DECs to non-public buildings</i>			by 2017	
<i>All public buildings covered by CRC to realise all cost effective emissions change potential</i>			by 2018	by 2018
<b>Other drivers</b>				
<i>Emissions and fuel consumption by subsector, GVA / GVA vs. GDP for each sub-sector, Electricity and gas prices</i>				

<b>Table 3.3</b> continued				
<b>Buildings and Industry</b>		<b>Budget 1</b>	<b>Budget 2</b>	<b>Budget 3</b>
<b>Industry</b>				
<b>Headline indicators</b>				
<i>CO<sub>2</sub> emissions (indicative minimum % change on 2007)*</i>	<i>direct</i>	-15%	-2%	8%
	<i>indirect**</i>	-12%	-35%	-66%
<i>Final energy consumption (indicative minimum % change on 2007)</i>	<i>non-electricity</i>	-20%	-21%	-19%
	<i>electricity (centrally produced)***</i>	-16% (-6%)	-11% (-18%)	-5% (-30%)
<b>Other drivers</b>				
<i>Emissions and fuel consumption by subsector, GVA / GVA vs. GDP for each sub-sector, Electricity and gas prices</i>				
<b>Renewable heat</b>				
<b>Headline indicators</b>				
<i>Renewable heat penetration</i>		1%	5%	12% in 2020
<b>Supporting indicators</b>				
<i>Renewable Heat Incentive in operation</i>		from April 2011		
<b>Other drivers</b>				
<i>Uptake and costs of renewable heat technologies (Biomass boilers, Solar thermal, GSHP and ASHP, District heating)</i>				

\* These indicators should be considered jointly. Reductions in total emissions from buildings and industry reflect savings from renewable heat. We do not however set out in advance the split of these savings across sectors. Therefore emissions changes for individual sectors do not assume any savings from renewable heat and reflect a minimum level of change.

\*\* Based on a reference projection net of electricity demand changes whose carbon intensity is assumed to be that of new build gas. Within our modelling of the power sector, emissions from electricity generation are lower than is represented here due to different assumptions about carbon intensity. The indirect emissions shown here are therefore conservative.

\*\*\* Figures show percentage changes in total electricity consumption including autogenerated electricity, and in centrally produced electricity only.

Note: Numbers indicate amount in last year of budget period i.e. 2012, 2017, 2022

Key: ■ Headline indicators ■ Implementation Indicators ■ Milestones ■ Other drivers

### Transport indicators

Transport indicators include trajectories for emissions, carbon intensity of cars, travel demand by mode and fuel consumption (Table 3.4):

- In our transport emissions reduction trajectories car emissions fall by 30% compared to 2007 levels by 2020 as lower gCO<sub>2</sub>/km offsets rising demand, van emissions rise by 30% (compared to a rise of 18% in our reference projection), and HGV emissions fall by 19% by 2020.
- Carbon efficiency of new cars improves from the current level averaging 158 g/km to 95 g/km in 2020.
- Electric car penetration reaches 240,000 by 2105 and 1.7 million by 2020 and biofuels penetration reaches 10% by 2020.
- Demand for car travel reaches by 418 billion vehicle-km in 2020 as Smarter Choices measures are implemented (compared to 432 billion vehicle-km in our reference projection).

**Table 3.4** Transport indicators

Road Transport		Budget 1	Budget 2	Budget 3
<b>Headline indicators</b>				
<i>Direct emissions (% change on 2007)</i>	Total	-11%	-19%	-29%
	Car	-17%	-24%	-37%
	Van	11%	16%	14%
	HGV	-13%	-16%	-19%
<i>gCO<sub>2</sub>/km (carbon intensity of a vehicle kilometre)</i>	Car	152	132	104
	Van	247	226	196
	HGV	743	687	639
<i>Vehicle-km billions</i>	Car	421	419	420
<b>Supporting indicators</b>				
<b>Vehicle technology</b>				
<i>New vehicle gCO<sub>2</sub>/km</i>	Car	142	110	95 (by 2020)
<i>New electric cars registered each year (value at end of Budget period)</i>		11,000	230,000	550,000
<i>Stock of electric cars in vehicle fleet</i>		22,000	640,000 (240,000 delivered through pilot projects in 2015)	2.6 million (1.7 million by 2020)
<b>Biofuels</b>				
<i>Penetration of biofuels (by volume)</i>		4.5%	7.9%	10.0%
<i>Decision on whether future biofuels target can be met sustainably</i>		2011/12		

Table 3.4 continued

Road Transport	Budget 1	Budget 2	Budget 3
<b>Demand side measures</b>			
<i>Proportion of drivers exceeding 70mph</i>		0%*	0%
<i>Car drivers who have undergone eco driving training</i>	1,050,000	2,800,000	4,550,000
<i>Smarter Choices – demonstration in a city and development plan for roll out if successful, demonstration in rural areas and demonstration targeting longer journeys</i>	2010		
<i>Smarter Choices – phased roll out to towns</i>	2010		Complete
<i>Development of integrated planning and transport strategy</i>	2011		
<b>Other drivers</b>			
<i>Fuel pump prices, Fuel duty, Proportion of new car sales that are 'best in class', Proportion of small/medium/large cars, Van and HGV km (vehicle/tonne)**, Petrol/diesel consumption, Surface transport modal split, Average speed of drivers exceeding 70mph</i>			
<i>Agreement of modalities for reaching an EU target of 95 gCO<sub>2</sub>/km target and strong enough penalties to deliver the target, New Car CO<sub>2</sub> in EU, New Van and HGV gCO<sub>2</sub>/km***, Number of EV car models on market, Developments in battery and hydrogen fuel cell technology, Battery costs</i>			
<i>Successful conclusion of EU work on Indirect Land Use Change/development of accounting system for ILUC and sustainability</i>			
<i>Number of households and Car ownership by household, Cost of car travel vs. cost of public transport, Funding allocated to and percentage of population covered by Smarter Choices initiatives†, Proportion of new retail floorspace in town centre/edge of centre locations, Ratio of parking spaces to new dwellings on annual basis</i>			

\* These are the values implied by the estimated savings from speed limiting. CCC recognise that in practice it is impossible to achieve zero speeding. However, as close to zero as practicable is required to achieve the greatest carbon savings.

\*\* We will include van and HGV km travelled in our headline indicators following new work on freight for our 2010 report.

\*\*\* We aim to include new van and HGV gCO<sub>2</sub>/km in our indicator set as the available monitoring data improves

† Our initial recommendation is for phased roll-out of Smarter Choices to further establish emissions reduction potential. If initial roll-out proves successful, our subsequent recommendation would be for national roll-out. We would then need to monitor population covered and also total expenditure to verify sufficient coverage and intensity. Once national roll-out is underway and suitable data sources are identified, population covered and total expenditure will be included in our set of supporting indicators.

Note: Numbers indicate amount in last year of budget period i.e 2012, 2017, 2022.

Key: ■ Headline indicators ■ Implementation Indicators ■ Milestones ■ Other drivers



#### 4. Summary of required policy strengthening to deliver budgets

The policy framework will be crucial in driving actions to meet indicators and reduce emissions. The policies summarised in the Low Carbon Transition Plan provide a good foundation for required actions.

The Committee notes, however, the broadly flat emissions trend in recent years and the need therefore for a fundamental shift if deep cuts required to meet carbon budgets are to be achieved going forward. Under current policies, it is the Committee's view that significant risks exist for meeting the second and third carbon budgets, and that policy strengthening is necessary across power, buildings and industry and transport sectors.

We now summarise key policy milestones and areas for policy strengthening identified by the Committee, with more detailed discussion presented in Chapters 4-6.

##### Power sector policy strengthening and milestones

**Wind generation.** In order to support very ambitious targets for investment in wind capacity, key decisions are required on power transmission access and investment. In particular, a new enduring regime for access that allows connection of new wind generation is required by 2010. Decisions to proceed on least-regrets investments in power transmission to support increased levels of wind generation are required by 2010.

**Nuclear generation.** The enabling framework for nuclear new build is currently under development. Key outstanding policy milestones include: issuing a national policy statement by 2010; Generic Design Assessment of reactor design completed by 2011; approval of first planning applications by 2011 to allow commencement of construction by 2012/13.

**CCS generation.** It is important to move forward with CCS demonstration in a timely manner. The first CCS demonstration competition should be concluded according to the schedule announced by the Government in June 2009. The second round of competitions, which in the view of the Committee should cover up to three projects, should commence in 2010 and conclude by 2011. The Government should announce now that a financing mechanism to support roll-out will be put in place following the demonstrations (e.g. no later than 2016). In addition, the Government should provide a very clear signal now that the role for any conventional coal plant remaining beyond the early 2020s would be very limited.

**Power market reform.** The Committee had previously raised the question whether investors could reasonably be expected to invest in low-carbon technologies under current market arrangements given multiple risks (e.g. over fossil fuel prices, carbon prices, electricity prices, technology costs and performance characteristics, etc.).

Based on a detailed consideration of new analysis, the Committee's view is that there are plausible scenarios where risk-averse investors will revert to investment in gas fired power generation rather than low carbon technologies. This is problematic given the centrality of power sector decarbonisation to decarbonisation in other sectors on the path to meeting the 2050 target.

The Committee therefore proposes that alternative options to strengthen incentives for investment in low-carbon technologies (e.g. carbon price underpin, low-carbon obligation, emissions performance standard, etc.) should be seriously considered. A near term review of these options is required in order that any new arrangements can be introduced on a schedule consistent with the timing of investment decisions to be made early in the second budget period.

### Strengthening of policy for buildings and industry

**Policy for residential buildings.** The supplier-led existing framework for energy efficiency improvement in residential buildings does not provide sufficient incentives for the deep emissions cuts required in this area. A new approach is required. The Government has acknowledged this in its draft Heat and Energy Savings Strategy. The Committee agrees with the high level approach proposed in the Government consultation. The Committee recommends that any policy should be developed in 2010-2011 for implementation from 2012, and should be based on:

- A whole house approach which covers the range of cost-effective measures for energy efficiency improvement and minimises transaction costs for households
- A street by street neighbourhood approach led by national Government, with a delivery role for local government in partnership with energy companies
- An appropriate balance between 'pay as you save' (i.e. loans for energy efficiency improvement which are repaid through cost savings due to lower energy consumption) and subsidised funding recognising that some measures do not save money (e.g. solid wall insulation) and that some groups (e.g. the fuel poor) may not be able to take on loans.

**Renewable heat.** Our Extended Ambition scenario includes significantly increased renewable heat penetration on the basis that the Government will introduce new policies in this area to meet EU renewable energy targets. The Government has recognised that new policies are required to address barriers to uptake including cost penalties for renewable heat technologies and consumer attitudes reflecting the fact that there is very limited experience of renewable heat in the UK. The Committee welcomes the proposed introduction of a Renewable Heat Incentive on which the Government will consult later in 2009.

### Energy efficiency improvement in the non-capped sectors.

The Committee has identified significant emissions reduction potential from energy efficiency improvement in non-residential buildings. Not, currently covered by policies for reduction of non-residential emissions (e.g. Climate Change Agreements, the Carbon Reduction Commitment, EU ETS). The Committee agrees with the Carbon Trust that new requirements should be introduced:

- All non-residential buildings to have an EPC in place by the end of the second budget period
- Minimum ratings set for all non-residential buildings (minimum EPC rating of F by 2020)
- Roll-out of DEC's to all non-residential buildings.

In relation to SMEs, a first step would be to develop a better understanding of emissions reduction opportunities by getting better information about the current state of the building stock. In this respect, information from Display Energy Certificates (DECs) and Energy Performance Certificates (EPCs) would help inform new policies. There are a range of policy options for SMEs that warrant further consideration including:

- Providing more financial support. Current financial and institutional support provided by the Carbon Trust could be scaled up to cover a larger proportion of the SME population.
- Extending the proposed new approach for the residential sector to cover SMEs. Some progress has already been made in this respect with the large energy companies in the UK entering voluntary agreements with Government to provide energy services to SMEs. There is a question, however, as to whether the voluntary basis of the scheme provides sufficient bite for energy suppliers to actively participate and whether the neighbourhood approach which could motivate households would provide the same incentives for SMEs.

- Mandating implementation of measures. As in the residential sector, regulatory measures may be required to achieve full take up of cost effective emissions reduction potential (e.g. mandating a minimum EPC rating on sale or letting of property, or linking business rates to the EPC rating).

The Government has established a new project that will consider possible new policies to support SME emissions reduction; this will be the first step towards unlocking significant SME emissions reduction potential.

### Transport policy strengthening

**Policy for new cars.** Incentives will be required in order to achieve the ambitious EU targets for carbon efficiency of new cars. These are likely to require both fiscal levers and better information. For electric cars specifically, financial support will be required both to cover cost premiums of early stage designs before battery costs fall, and charging infrastructure cost. The Government's commitment to provide £250 million to support electric car deployment is a very useful start in this respect, although further funding is likely to be required. Government-sponsored pilot projects should aim to achieve 240,000 electric cars on the road by 2015 on the way to 1.7 million by 2020 in order that a critical mass is reached and the electric car option developed to achieve significant market share in the 2020s; design of projects should start now in order to support early implementation.

**Roll out of Smarter Choices.** Evidence from Sustainable Travel Towns suggests that car travel demand reductions are at the top end of the range that had been suggested in the literature. Based on this evidence, it is the Committee's view that the Government's new Sustainable Travel City should be complemented by phased roll out of Sustainable Travel Towns, and a plan for roll out of Sustainable Travel Cities depending on the experience in the pilot project. There should also be demonstrations focussing on rural areas and on longer journeys.

### Integrated land use and transport planning.

Up to 3 million new houses will be built in the UK in the period to 2020. Analysis suggests that if these were built without regard for transport implications then overall emissions could increase, even if the new houses are zero carbon. For existing developments, there is wide variation in average emissions for cities in the UK and beyond, suggesting that there is scope for emissions reduction through changing land use planning and transport policy. The Committee therefore recommends that the Government should develop an integrated land use and transport strategy designed to fully account for transport emissions.