Chapter 3: Progress reducing emissions from buildings and industry

Introduction and key messages

In our previous reports we identified major opportunities for reducing emissions from buildings and industry through a range of energy efficiency measures. Improving energy efficiency will make a significant contribution to meeting carbon budgets and to offseting energy price impacts from other measures to meet budgets.

In addition, our analysis has suggested scope for significantly increasing the level of renewable heat from current very low levels. Progress on renewable and low-carbon heat can usefully contribute to the first three carbon budgets, and help to prepare for further heat decarbonisation that will be required to meet carbon budgets through the 2020s.

Our indicator framework for buildings and industry, set out in our 2009 progress report, included trajectories for key measures (e.g. lofts and cavity wall insulation, penetration of efficient appliances) and policy milestones (e.g. introduction of new incentives for residential and commercial energy efficiency improvement). In this chapter we consider latest emissions data for buildings and industry and we apply the indicator framework. We conclude that:

- While there have been recent emissions reductions in the buildings and industry sectors, the main driver is likely to have been the recession rather than policy strengthening.
- In industry, emissions remain closely coupled to economic activity, and some emissions bounceback is likely as the economy recovers.
- There has been some progress implementing measures, most notably loft and cavity wall insulation, and boiler replacement. However, overall the pace of progress remains slow relative to what is required to meet the first three carbon budgets.

There have been some positive policy proposals and announcements but further development is required:

- In the context of the new Government's commitment to a 'Green Deal' and early legislation to deliver a National Energy Efficiency Programme, it is important to develop detailed implementing arrangements (e.g. financing arrangements, including the balance between 'Pay As You Save' and other funding arrangements to support the implementation of more expensive measures and energy efficiency improvement for the fuel poor; how homeowners will be encouraged to participate through marketing, pro-active provision of energy audits and financial incentives/standards; the specific roles of local authorities, energy companies and other players; and standards for the private rented sector).
- The Renewable Heat Incentive (RHI) proposals suggest a level of ambition for deployment that is broadly consistent with our analysis, although further consideration of tariff levels for specific technologies may be required. The RHI should be better integrated with the framework for energy efficiency (so as to encourage renewable heat in the context of improved energy efficiency).
- Proposals for the wider roll-out of EPCs and DECs in non-residential buildings would underpin the proposed 'Pay As You Save' scheme for the non-residential sector, and should be taken forward to help unlock significant emission reduction opportunities in this sector. Consideration should also be given to strengthening the compliance framework.

The analysis that underpins these messages is set out in seven sections:

1. Progress reducing emissions
2. Opportunities for reducing emissions – the Committee's buildings and industry indicator framework
3. Residential buildings
4. Non-residential buildings
5. Emissions from industry
6. Low carbon and renewable heat
7. Departmental carbon reduction delivery plans

1. Progress reducing emissions

Emissions from buildings and industry

Emissions from buildings and industry account for around two-thirds of total CO_2 emissions in the UK. They comprise direct (i.e. due to burning of fossil fuels for heating and industrial processes) and indirect emissions (i.e. due to electricity consumption and other indirect fuel use), with direct emissions accounting for around half of total buildings and industry emissions. On a sectoral basis, residential emissions account for the largest share of the total in 2008 (41%), followed by industry (38%), commercial (15%) and public sector (6%) emissions.

Our 2009 progress report showed that emissions from buildings and industry fell by 3% in the five years preceding the first budget (2003 – 2007), with the residential sector accounting for 68% of this reduction.

Our analysis suggesting that emissions would fall further during the recession has been borne out by data for 2008 and 2009:

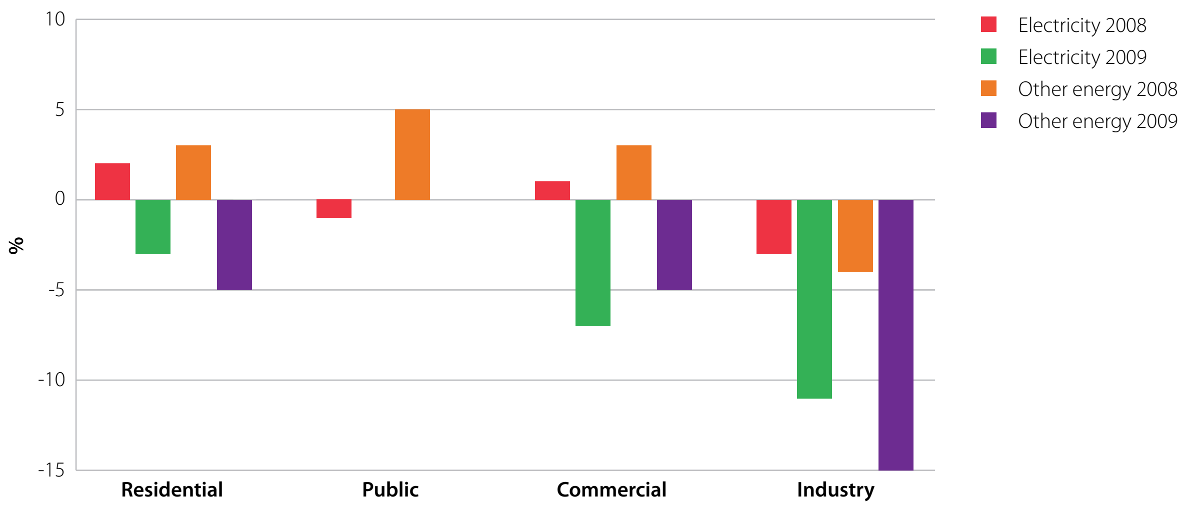
- In 2008 (i.e. before more significant GDP reductions), buildings and industry emissions continued the trend of the previous five years, falling by around 1% year-on-year.
- Provisional 2009 emissions data suggests that significant reductions have occurred over the past year. Specifically, direct emissions fell by 11% and indirect emissions (i.e. from electricity consumption) fell by 13%, due to reduced energy demand during the recession (Figure 3.1) and a 9% reduction in the CO_2 intensity of electricity.

Emissions from residential buildings

Emissions from residential buildings grew by 2% in 2008 and fell by 7% in 2009, with reductions in both direct and indirect emissions (Figure 3.2), due mainly to rising fuel prices and the recession:

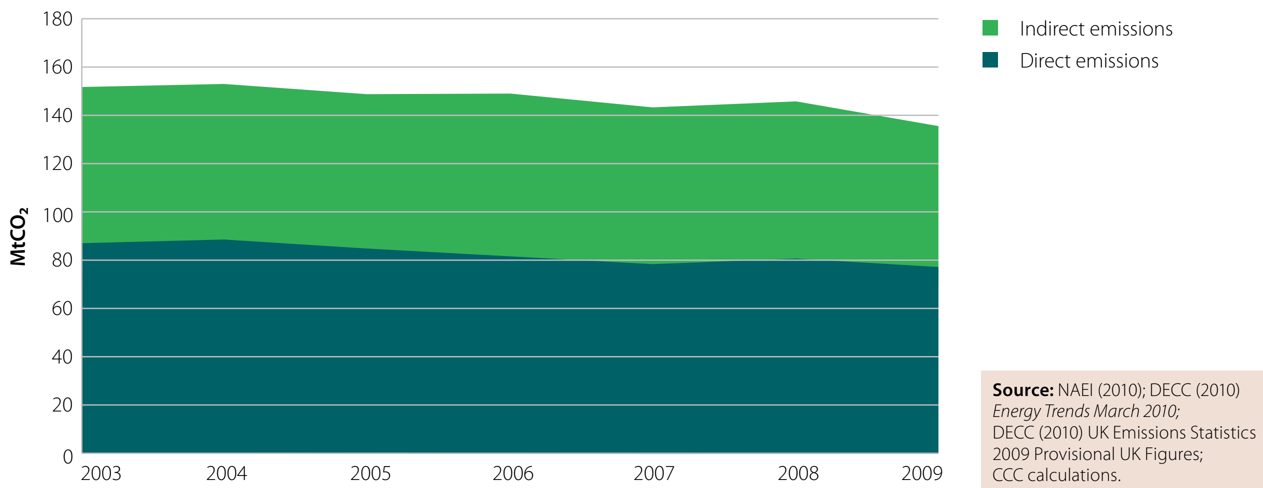
- Direct emissions rose by 3% in 2008 while indirect emissions stayed broadly flat.
- In 2009 direct emissions fell by 5%, while electricity emissions fell by 10%.
- Some savings are attributable to the installation of energy efficiency measures (see section 3). However, this explains only a small part of the observed emissions reduction.

Figure 3.1 Change in energy consumption (2008 and 2009)



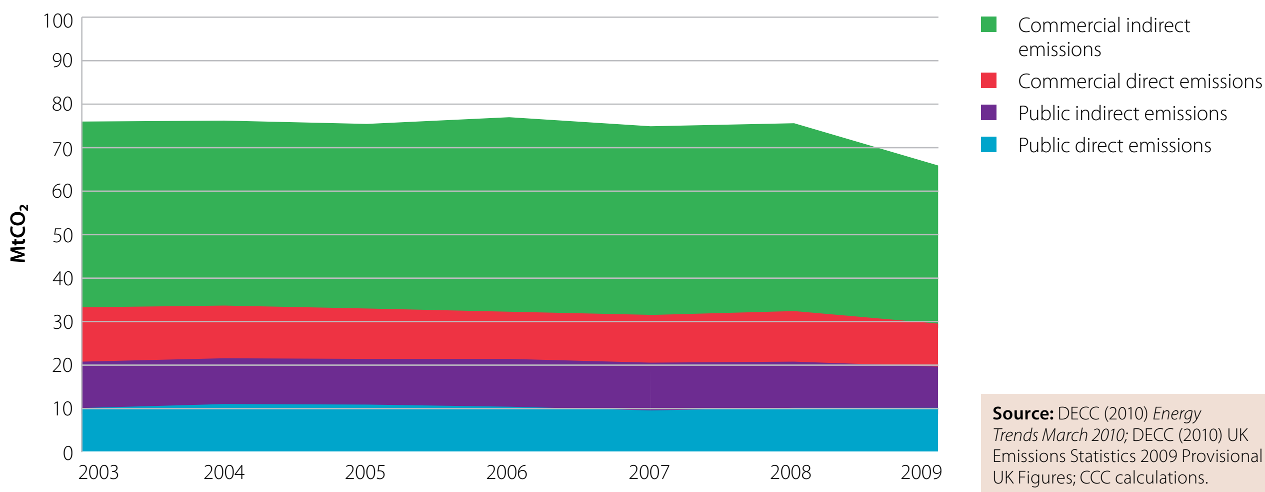
Source: DECC (2010) *Energy Trends March 2010;* CCC calculations.

Figure 3.2 Residential CO_2 emissions (2003-2009)



Source: NAEI (2010); DECC (2010) *Energy Trends March 2010;* DECC (2010) UK Emissions Statistics 2009 Provisional UK Figures; CCC calculations.
Note: 2009 emissions are provisional and based on CCC estimates. Indirect emissions are based on consumption of electricity from power stations only.

Figure 3.3 Non-residential CO_2 emissions (2003-2009)



Source: DECC (2010) *Energy Trends March 2010;* DECC (2010) UK Emissions Statistics 2009 Provisional UK Figures; CCC calculations.
Note: 2009 emissions are provisional and based on CCC estimates. Indirect emissions are based on consumption of electricity from power stations only.

- Therefore it is likely that the 2009 reductions are primarily a result of rising fuel prices (residential gas and electricity prices rose 12% and 3% respectively in real terms) and the recession. While generally residential energy demand is relatively inelastic to income and price, there is evidence that the recession and high fuel prices have resulted in some behaviour change to reduce energy consumption[1].

Emissions from the public sector

In our 2009 progress report, we highlighted the importance of the public sector leading by example. This has been accepted, and reflected in ambitious emissions reduction targets for the public sector. However, and notwithstanding this ambition, there has been little change in public sector emissions in recent years (Figure 3.3).

- Total CO_2 emissions in 2008 were broadly constant.
- A reduction in indirect emissions of around 7% occurred in 2009 as a result of a reduction in the emissions intensity of power generation but direct emissions were broadly unchanged.
- In the period 2003-07, CO_2 emissions fell by 1% with a 5% reduction in direct emissions partially offset by a rise in indirect emissions.

Emissions from commercial buildings

Around 80% of commercial sector emissions are indirect. Prior to the recession, commercial emissions were broadly flat.

In 2008, direct emissions increased by 6%, with indirect emissions remaining flat, and average emissions increasing by 1% (Figure 3.3).

Initial estimates for 2009 suggest significant reductions in 2009, with a reduction of 14% in indirect emissions and 10% in direct emissions. Commercial sector energy consumption fell by around 6%, reflecting reduced GVA of 5%.

Emissions from industry

Industrial emissions fell significantly between 1990 and 2008 (by around 20%) due to fuel switching and industry restructuring, with large reductions in the mid to late 1990s.

Further reductions have occurred since the onset of the recession (Figure 3.4):

- Industry CO_2 emissions fell 4% in 2008, with similar reductions in direct and indirect emissions.
- Provisional estimates suggest that direct and indirect emissions have fallen further in 2009, by 18 and 19% respectively.

Attributing these falls in emissions to specific causes, for example the EU ETS and the recession, is complex and requires further systematic analysis. However, the conjunction of reductions in output and emissions in key UK EU ETS sectors during 2009 suggests that the recession played a key role:

- Output from the manufacture of basic metals (including steel) fell by 19% and emissions from pig iron and steel fell by approximately 14%.
- Output from manufacturing of mineral products (including cement) fell by 13% and emissions from cement, clinker and lime production fell by nearly 30%.

Large reductions in emissions have also occurred across the EU in 2009, compared with flat or rising emissions previously (e.g. 28% fall in emissions from pig iron and steel, and 20% fall in cement, clinker and lime in 2009).

To the extent that emissions reductions have resulted from the recession, there is the potential for some bounceback in emissions as the economy recovers. This will depend on the extent to which there is long-term income reduction, any permanent closure of businesses, lasting fuel switching, energy efficiency improvement, etc.

1 uSwitch (2010) 13 million households go without heating to save on energy bills. *http://www.uswitch.com/news/utilities/13-million-households-go-without-heating-to-save-on-energy-bills-1022/*

However, through the combination of these factors, it is likely that there will be some persistent emissions reductions in some key sectors:

- In the cement sector there have been closures of inefficient plant. Some of the production has been rationalised and moved to other, more efficient cement plants in the UK, which could lead to a persistent emissions reduction.
- In the steel sector, the extent to which closures or mothballing of plant beyond 2010 lead to a persistent reduction in emissions depends upon whether production is moved to other plant, or if plant re-opens in the longer term.

Required emission reductions to 2022

Emission reductions in 2008 and 2009 will contribute towards meeting the first carbon budget. Going forward, our analysis suggests that emissions reductions of around 3% annually will be required across buildings and industry in the period to 2022. Given that emissions reductions in 2008 and 2009 have been largely due to the recession rather than outperformance on measures, a step change in the implementation of measures, especially in residential and non-residential sectors (Figure 3.5, Figure 3.6 and Figure 3.7) will be required if the second and third budgets are to be achieved.

2. Opportunities for reducing emissions – the Committee's buildings and industry indicator framework

In our 2009 progress report we identified a range of opportunities for emission reductions. Based on these and existing government policy commitments, we set out a framework of indicators to help assess progress towards meeting carbon budgets. For buildings and industry these include high level emissions trajectories, with underpinning trajectories for the implementation of measures (in the residential sector), policy milestones for energy efficiency and the penetration of renewable heat (see Table 3.1 at the end of the chapter).

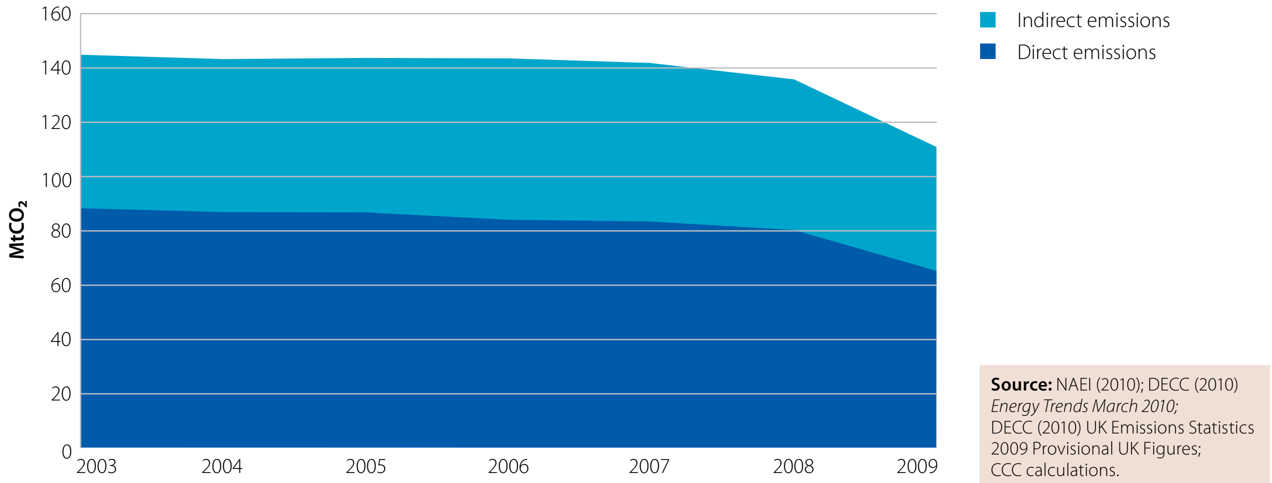
The trajectories were set based on 2007 emissions levels, prior to the recession (Figure 3.5, Figure 3.6 and Figure 3.7). The recession has meant that emissions have fallen by more than we had anticipated. However, the extent to which these emissions reductions will persist over time is not yet clear (discussed further in Chapter 1, Box 1.2).

- **Residential sector:** our analysis suggests that there is scope for emission reductions of 4% annually in the period to 2022, primarily through insulation of lofts, cavity and solid walls, boiler replacement, and increased penetration of efficient appliances.
- **Non-residential buildings:** we estimate that there is scope for emissions reductions of 4% annually in the period to 2022 through the uptake of energy efficiency measures, efficient lighting and less energy-intensive appliances. We are currently reviewing these estimates in the context of the Committee's advice on the Carbon Reduction Commitment (see section 4), to be published in autumn 2010.
- **Industry:** our analysis suggests that there is potential to reduce industry emissions by 2% each year in the period to 2022. This could be achieved through a range of measures such as improvements in the efficiency of electrical machinery, renewable heat applications and heat recovery. However, there are limitations with the current evidence base (see section 5) and we noted in our 2009 progress report that there may be additional abatement available in industry. The Committee will conduct a review of further abatement potential in industry as part of its work for the fourth budget period.
- **Renewable heat:** our analysis suggests that there is realistic scope for emission reductions of 20MtCO_2 in 2022 across all sectors through increased penetration of renewable heat technologies such as heat pumps and biomass boilers. This is broadly consistent with the ambition in the Renewable Energy Strategy to achieve renewable heat penetration of 12% by 2020, which would save around 17 MtCO_2.

Implementation of all the identified measures, including renewable heat, would result in around 3% annual emissions reduction from buildings and industry. Together with appropriate contributions from other sectors this would deliver carbon budgets.

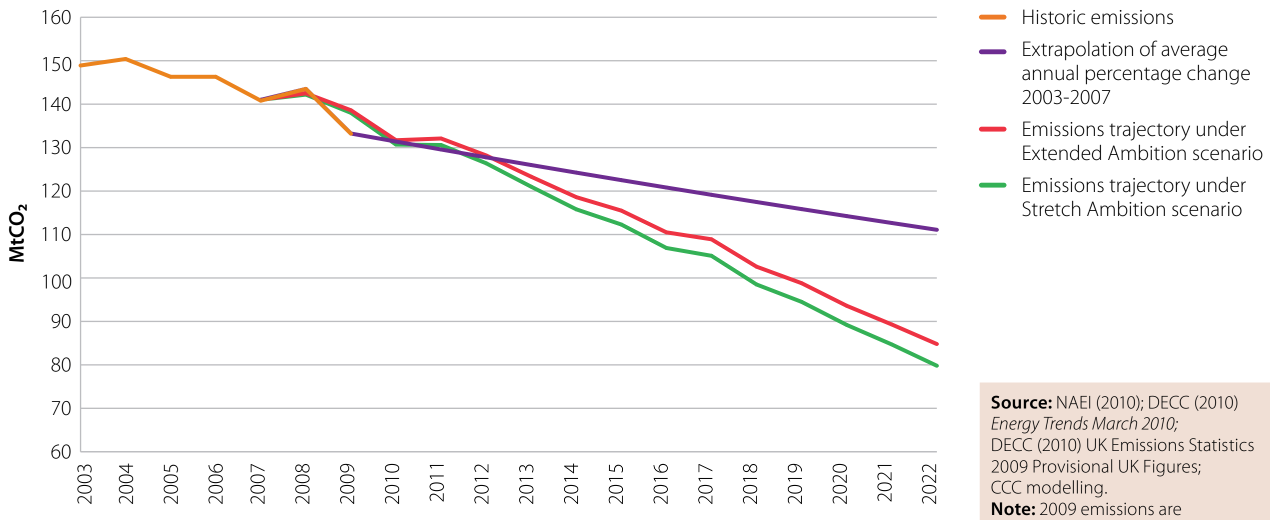
We now consider the extent to which the implementation of key measures and policy developments in 2008 and 2009 are consistent with the required trajectories.

Figure 3.4 Industrial CO_2 emissions (2003-2009)



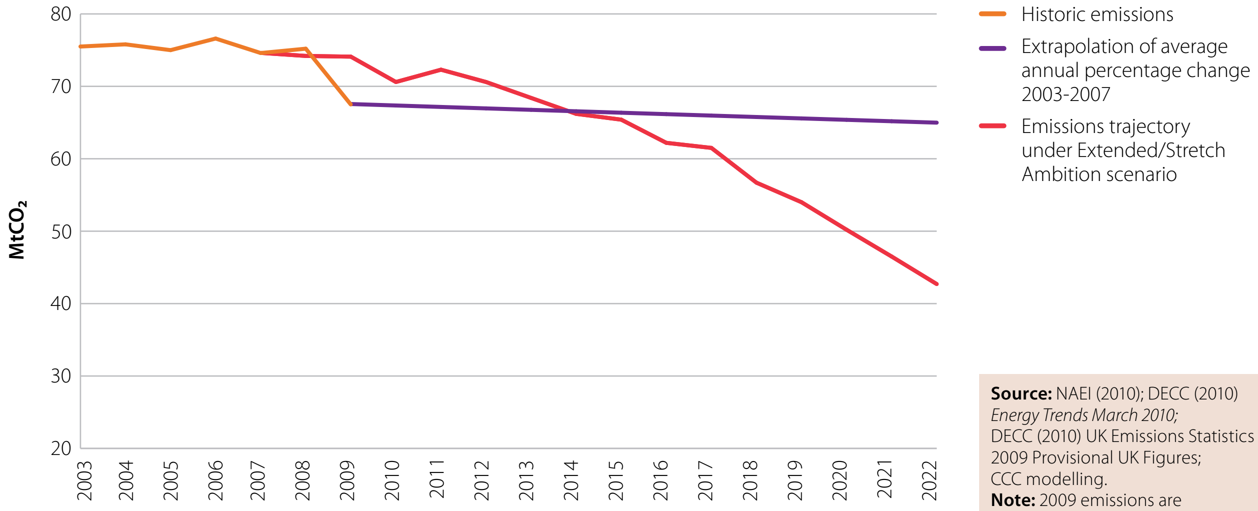
Source: NAEI (2010); DECC (2010) *Energy Trends March 2010;* DECC (2010) UK Emissions Statistics 2009 Provisional UK Figures; CCC calculations.
Note: 2009 emissions are provisional and based on CCC estimates. Indirect emissions are based on consumption of electricity from power stations only.

Figure 3.5 Recent residential CO_2 emissions and reductions required under CCC scenarios (2003-2022)



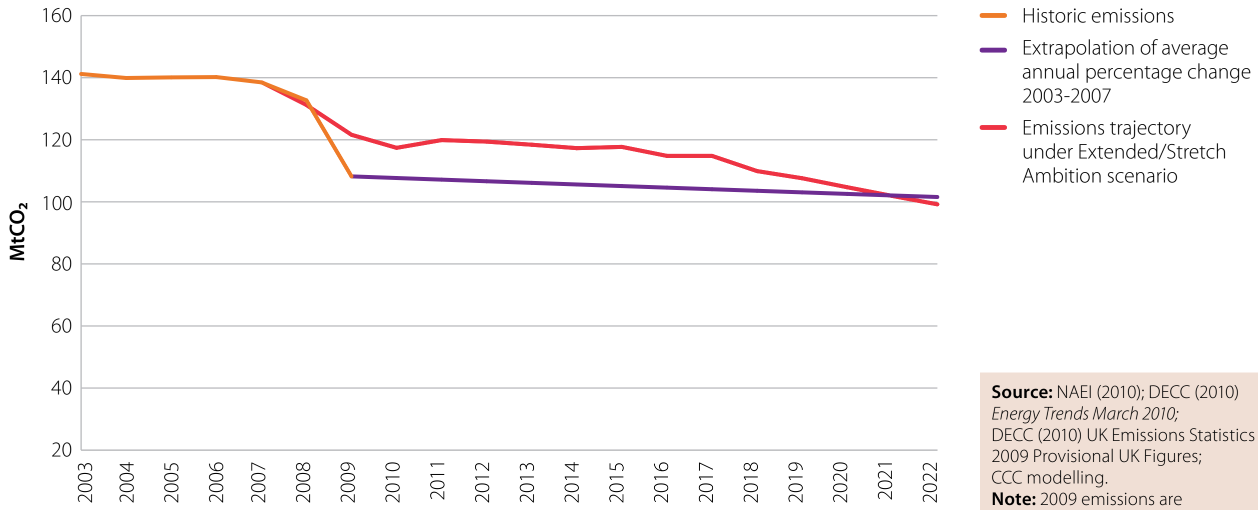
Source: NAEI (2010); DECC (2010) *Energy Trends March 2010;* DECC (2010) UK Emissions Statistics 2009 Provisional UK Figures; CCC modelling.
Note: 2009 emissions are provisional and based on CCC estimates. Indirect emissions are based on consumption of electricity from power stations only.

Figure 3.6 Recent non-residential CO_2 emissions and reductions required under CCC scenarios (2003-2022)



Source: NAEI (2010); DECC (2010) *Energy Trends March 2010;* DECC (2010) UK Emissions Statistics 2009 Provisional UK Figures; CCC modelling.
Note: 2009 emissions are provisional and based on CCC estimates. Indirect emissions are based on consumption of electricity from power stations only.

Figure 3.7 Recent industrial CO_2 emissions and reductions required under CCC scenarios (2003-2022)



Source: NAEI (2010); DECC (2010) *Energy Trends March 2010;* DECC (2010) UK Emissions Statistics 2009 Provisional UK Figures; CCC modelling.
Note: 2009 emissions are provisional and based on CCC estimates. Indirect emissions are based on consumption of electricity from power stations only.

3. Residential buildings

Implementation of energy efficiency measures

The uptake of energy efficiency measures is a key part of meeting the first three carbon budgets. The Carbon Emission Reduction Target (CERT) remains the main delivery instrument, with some additional delivery from fuel poverty schemes (primarily Warmfront), the Community Energy Saving Programme (CESP) and Devolved Administration schemes (Box 3.1).

Box 3.1 Devolved Administration residential energy efficiency schemes

Scotland

The Scottish Government provides £45.9 million in 2010-11 for the Energy Assistance Package to improve energy efficiency in fuel poor households. It has also increased funding for the Home Insulation Scheme's second year of operation. An additional £10m will take funding for 2010/11 to £25m and support a new universal access scheme offering free insulation measures to around 90,000 homes. In addition, a recent pilot offered energy efficiency loans for householders worth over £2 million. The Scottish Government's consultation on its Energy Efficiency Action Plan was launched in late 2009 and the Plan is due to be finalised in 2010.

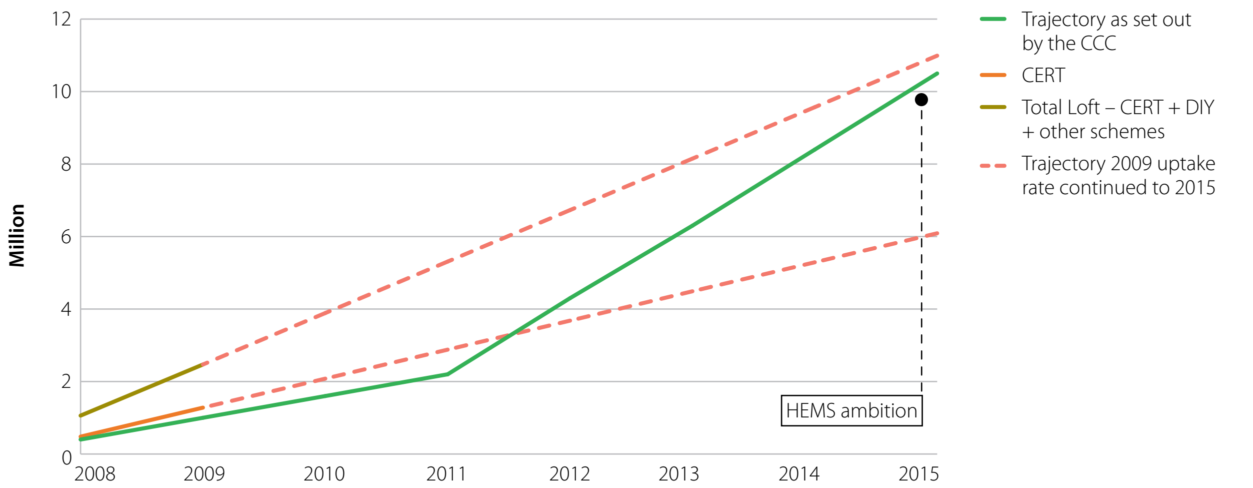
Wales

In May 2010, the Welsh Assembly Government launched the £30 million 'arbed' scheme aimed at reducing fuel bills and emissions in 6000 homes by March 2011. The first phase will see an average of £2.5 million spent every month to retrofit exterior wall insulation, solar panels and heat pumps in at least 21 schemes across Wales' regeneration areas. The project also aims to create new green jobs and boost the energy efficiency and renewable energy industry in Wales. Following a consultation, the Government is due to publish its Energy Efficiency Action Plan later in 2010.

Northern Ireland

The revised Northern Ireland Sustainable Energy Programme commenced in April 2010. Whilst the scheme is primarily focused on alleviating fuel poverty (including 34% of total funding ring fenced for whole house measures, including solar water heating and biomass boilers), the scheme is also available to business customers. The scheme's predecessor, the Energy Efficiency Levy, provided funding of just under £6m in 2008/09 which supported 21 projects resulting in carbon savings of around 149,000 tonnes.

Figure 3.8 Loft insulation cumulative installations (2008-2015)



Source: OFGEM CERT data; DECC estimates; CCC calculations.

Insulation measures

There has been some progress insulating lofts and cavity walls in 2009, and very limited progress insulating solid walls:

- Between 2008 and 2009, the rate of professional loft installation measures under CERT increased by 68% to 0.8 million, while cavity wall installations increased by 15% to 0.6 million.
- According to DECC figures, loft insulation (including DIY and other schemes such as Warmfront) totalled 1.4 million installations in 2009, an increase of one-third over 2008. However, there is considerable uncertainty around the number of DIY installations and to what extent there has been double-counting of loft insulation material subsidised under CERT.
- If loft insulation continues at the 2009 rate of installations (and provided there is no double-counting), it will meet the required trajectory for the period to the end of 2015 (Figure 3.8). However, as a progressively larger proportion of lofts has been insulated and there are fewer 'low hanging fruit', it will become increasingly challenging to maintain such a high number of installations.
- For cavity walls, while the current annual installation rates are broadly on track, they would have to more than double from 2012 to meet our trajectory of 8 million installations between 2008 and the end of 2015 (Figure 3.9). However, DECC has to date only committed to insulating 75% of the cavity-walled homes (see below) which translates to a much lower ambition of around 4 million.
- The pace of solid wall insulation under CERT has picked up a little, although installation rates were still only around 15,000 in 2009. Installation rates need to increase rapidly to achieve the required 2.3 million by 2020 (Figure 3.10).

Therefore, to meet the first three carbon budgets, acceleration is required in the pace of cavity wall insulation and particularly solid wall insulation. For lofts, the current pace needs to be sustained at a minimum, with acceleration required depending on the extent to which there is double counting between professional and DIY installations.

We note that since the publication of our insulation indicators in the October 2009 progress report, DECC has clarified its ambition to insulate all lofts and cavities 'where practicable' by 2015. While we interpreted 'where practicable' as 90% of 2005 remaining potential, DECC is currently aiming at 85% and 75% of all lofts and cavities respectively.

Given the uncertainty over evidence underpinning these potentials, we will continue to measure progress against our (more ambitious) indicators. We will also work with DECC to better understand their lower level of ambition, and what implications this might have for the level of ambition of other measures (e.g. does this imply that a larger number of homes need solid wall insulation in order to achieve carbon budgets).

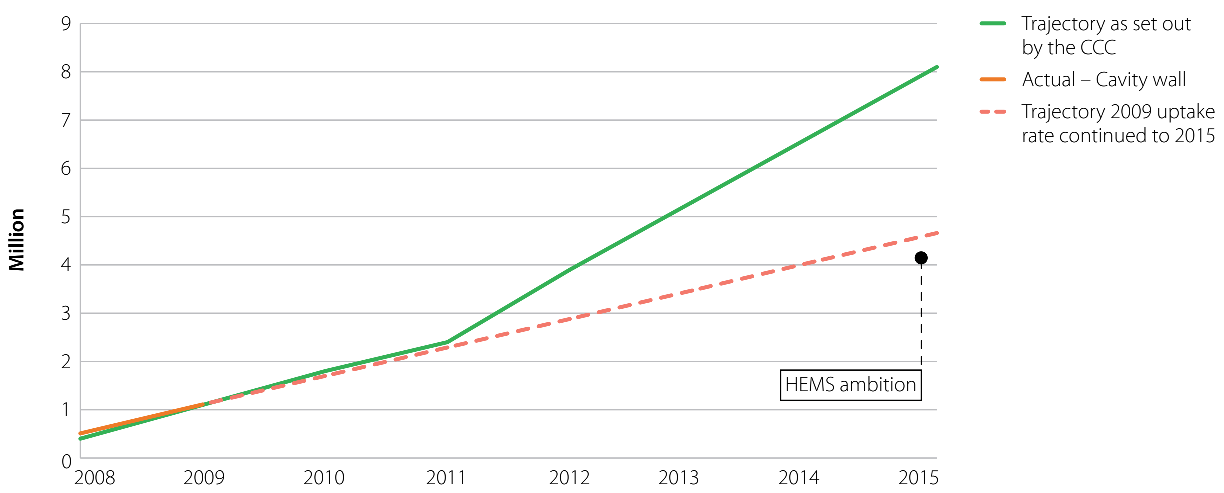
Boiler replacement

Sales of A rated energy efficient boilers in 2008 and 2009 were around 1.2 million per annum. This is ahead of our trajectory set out in October 2009. If uptake continues at these rates, there could be scope for replacement of an additional 4 million boilers by 2022 (i.e. over and above the 12 million that we assumed, (Figure 3.11). Since early 2010, boiler replacement has benefited from several boiler scrappage schemes (Box 3.2) which may accelerate replacement rates.

Box 3.2 Boiler scrappage schemes

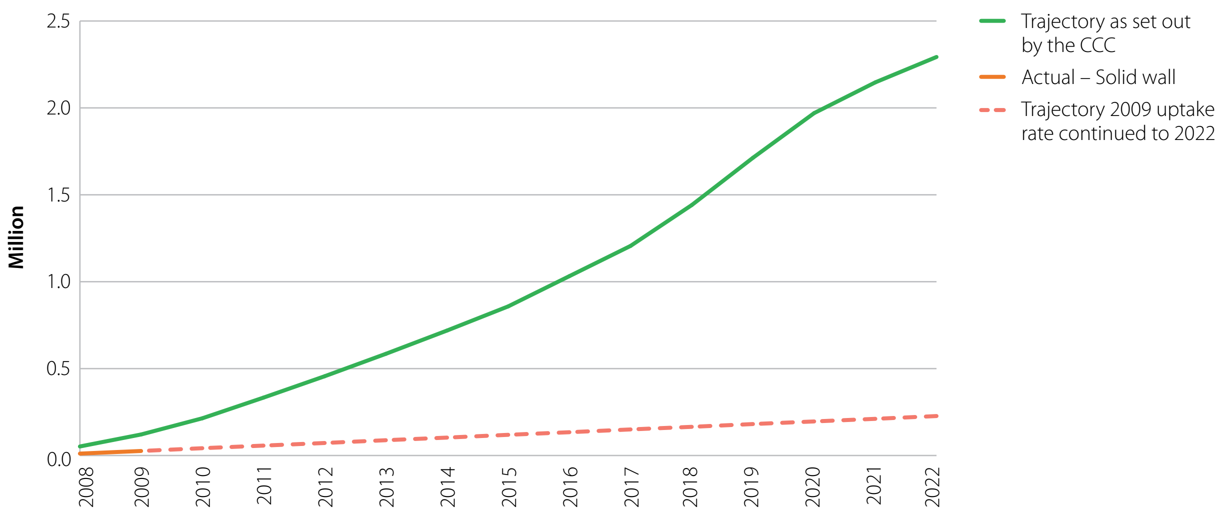
The UK Government's boiler scrappage scheme was launched in January 2010 with funding of £50 million to upgrade up to 125,000 household heating systems in England only. The scheme offered a £400 voucher to help offset the costs of upgrading from an inefficient 'G' rated boiler to an 'A' rated boiler. The scheme was so successful that the scrappage funds were exhausted at the end of March 2010. A similar Welsh scheme started in April 2010 offering a £500 discount, whilst a Scottish Government scrappage scheme, aiming to replace 5,000 boilers through £400 grants, allocated all funds within two days of its launch in May 2010.

Figure 3.9 Cavity wall insulation cumulative installations (2008-2015)



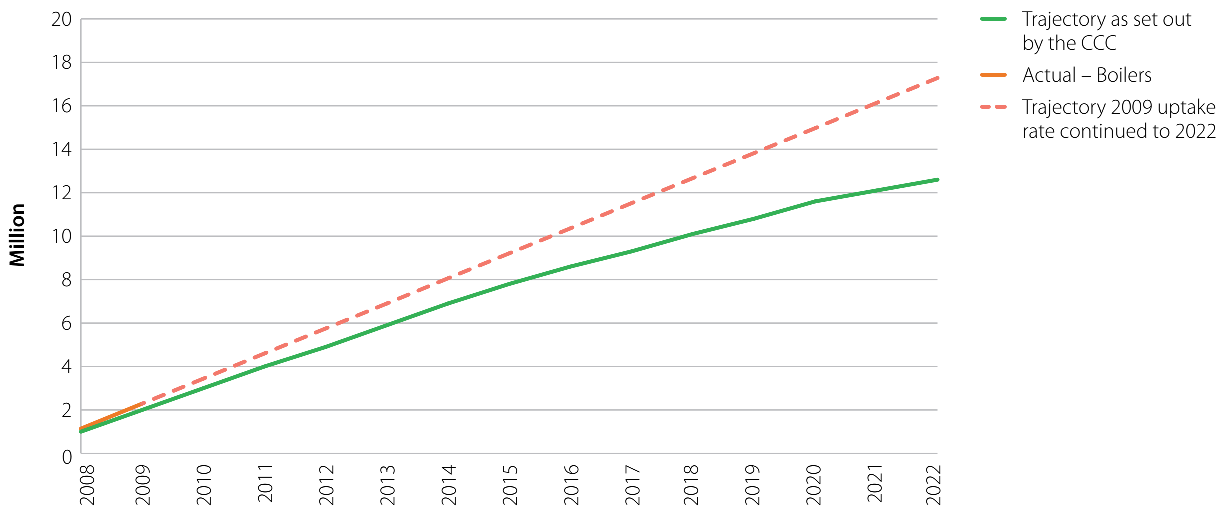
Source: OFGEM CERT data; CCC calculations.

Figure 3.10 Solid wall cumulative installations (2008-2022)



Source: OFGEM CERT data; CCC calculations.

Figure 3.11 A rated boilers cumulative installations (2008-2022)



Source: Heating and Hotwater Industry Council (2010); CLG; CCC calculations.

Energy efficient appliances

2009 sales data suggests that stock penetration of energy efficient cold and wet appliances remains very low, especially for cold appliances:

- Total cold and wet appliance sales have declined by 8% from 2008 to 2009 due to the recession, thus resulting in lower stock replacement levels and slower penetration of efficient appliances.
- While sales of A++ cold appliances increased by 73% between 2008 and 2009, they still account for only 0.2% of total cold appliance sales. To achieve a stock penetration of 45% by 2022, our trajectory suggests sales of A++ appliances should have reached 4% of the total in 2009.
- A+ wet appliances accounted for around 22% of total wet appliance sales in both 2008 and 2009, with total A+ sales declining by 3.5% in 2009. Sales in 2009 are 20% below our trajectory to achieve a 82% stock penetration of A+ (or better) appliances by 2022.

Due to a lack of robust sales data we have not set trajectories for other appliance classes (lighting, consumer electronics, home computing and cooking appliances). However, we note the significant scope for emissions reductions from these appliances.

Whilst general requirements for appliance efficiency are set at the EU level, the UK has gone further in certain cases (e.g. for phasing out of inefficient incandescent light bulbs through a voluntary agreement). Similar initiatives to improve standards could usefully be applied to other appliances.

Policy milestones

In our 2009 progress report, we stressed the need for a new policy framework to deliver a much higher level of ambition on energy efficiency. We outlined that the key features of the new policy should include:

- **Whole house packages** covering the range of cost effective measures to reduce residential emissions, with an energy audit and follow up to be offered to every household.
- **Neighbourhood/area based approach** with Government showing leadership and establishing energy efficiency improvement as a national priority; local authorities to have a key role in implementation in partnership with energy companies and other organisations.

- **New financing mechanisms** with a mix of individual charging of beneficiaries through schemes like 'Pay As You Save', and continued financing through the socialisation of costs, subsidies and other incentives.
- **Standards** which in the first instance should focus on the private rented sector to address the landlord-tenant split.

In March 2010, DECC and CLG published a new Household Energy Management Strategy (HEMS), which is broadly consistent with our recommendations (Box 3.3).

Box 3.3 HEMS key features

- An obligation on energy companies working in partnership with local authorities and other organisations to deliver up to 7 million 'eco-upgrades', including as many as 2.3 million solid walls insulation measures.
- Total cost of insulation measures 2013-2020 to come to £18.6 billion (£2.3 billion per annum).
- Two-thirds of the finance required to be delivered through the obligation but with no additional impact on fuel bills. Spending under the new obligation will be more transparent than CERT.
- Recognition that smart meter roll-out is a major opportunity to provide advice.
- Legislation to enable 'Pay As You Save' financing as a charge on the property. Finance to be provided by the private sector.
- Warm Homes standard for social housing and proposals for regulation for the private rented sector – standards in these two sectors are particularly important for addressing fuel poverty.
- Universal advice service and accreditation for installers.

The HEMS framework is a positive high-level step to encourage home energy efficiency improvement, but detailed implementing arrangements should now be developed to deliver the new Government's commitment to a 'Green Deal' and a National Energy Efficiency Programme. In particular, the following key areas need to be elaborated to provide confidence that the proposed approach will deliver:

- **'Eco-upgrades'/Green Deal Measures.** These should include a wide range of potential options to allow significant carbon reductions, including solid-wall insulation, 'A' rated energy efficient glazing, floor insulation and heating controls. The role of energy audits should be spelt out, especially in relation to the smart meter roll-out to ensure a pro-active approach to providing information to households to trigger action.
- **Partnership approach.** The roles and responsibilities of various organisations (national government, local government, energy companies, and other organisations) in the proposed partnerships to deliver area-based programmes should be clearly set out. The introduction of a statutory instrument underpinning the approach should be considered.
- **Financing mechanisms.** More details are required on the balance of funding between 'Pay As You Save', the socialisation of costs (e.g. spreading costs across the consumer base to provide free measures for the fuel poor and to subsidise some of the less cost-effective measures) and other financing mechanisms (e.g. a possible role for a Green Infrastructure Bank, as discussed in Chapter 2).

- **Role for standards/fiscal incentives.** In 'Hard-to-treat-homes' an effective energy efficiency package is likely to cost in excess of £10,000, with long payback periods of 20 years or more. A 'Pay As You Save' scheme alone is unlikely to persuade sufficiently large numbers of households to undertake the full range of measures. Therefore, standards for levels of energy performance and the provision of additional incentives (e.g. subsidised loans, council tax and other rebates for the less cost-effective options) should be considered.
- **Level of ambition.** A justification of the proposed ambition to insulate only 75% of cavity walls should be provided (see above), together with a consideration of possible alternatives for emission reductions in those homes deemed unsuitable. A credible strategy is needed for the proposed transition from insulation of solid walls in the social housing sector to the owner occupied sector, noting the significant delivery differences between these two market segments.

Given the importance of energy efficiency improvement, early clarification through setting out a detailed implementing framework is necessary if these measures are to contribute appropriately to meeting carbon budgets.

Zero carbon homes

With regard to reducing emissions from new residential buildings, progress has been made during the last year towards meeting the commitment that all new homes in England will be zero carbon from 2016 (e.g. proposing a definition for zero carbon and consulting on what the energy efficiency standard for new homes should be), with positive developments also in the Devolved Administrations (Box 3.4). The timing of this policy and the slow build rate for new properties means that this will be of more relevance for future carbon budgets as we move towards the fourth budget period and beyond.

Box 3.4 Zero carbon buildings and the Devolved Administrations

Scotland

New building regulations for Scotland will come into force in October 2010. These will enhance energy standards for both homes and non-residential buildings, including a reduction in emissions from new buildings of 30% compared to 2007 standards. A sustainability standard is under development that aims to set optional higher levels of carbon and energy targets, include wider aspects of sustainability, and clearly recognise developments that meet or exceed the 2010 standards. With the ambition of net zero carbon buildings by 2016/17 if practical, a further review of energy standards is planned for 2013 and 2016.

Wales

The Welsh Assembly Government is seeking to achieve a zero carbon buildings standard by 2011. Unlike for England, the 2011 ambition in Wales applies to all new buildings (residential and non-residential) from the outset. In moving towards this, there is a requirement, over certain thresholds, that new homes must meet the Code for Sustainable Homes Level 3 and non-residential buildings the 'BREEAM' 'very good' rating. Transfer of building regulations to Welsh Ministers will be effective as of the end of 2011.

Northern Ireland

Northern Ireland requires that new social housing meets the Code for Sustainable Homes Level 3, and as of April 2010 also offers rate relief on low and zero carbon new build homes. All new public sector buildings have to be zero carbon by 2018.

4. Non-residential buildings

Roll out of energy certificates to improve transparency

In developing an indicator framework for the non-residential sector, we noted that the evidence base about emissions abatement potential is highly uncertain. Therefore we did not attempt to set out trajectories for specific measures (e.g. to improve energy efficiency, and better manage energy). Rather, we recommended that the evidence base should be improved by rolling out Energy Performance Certificates (EPCs) and Display Energy Certificates (DECs), which would also enable firms and organisations to act on new information about abatement opportunities, and would provide scope for Government to introduce appropriate policy levers (e.g. regulation for SMEs based on achieving minimum ratings).

CLG has since published new proposals which are in line with the Committee's recommendations:

- CLG has consulted on extending DECs to cover commercial buildings, initially those with a floor space of 1,000m^2 and over, which is expected to cover 30,000 buildings. The eventual target is to include all commercial buildings of over 250m^2. This goes beyond the recast of the EU Energy Performance of Buildings Directive (EPBD2), which restricts the roll-out to buildings occupied by a public authority and frequently visited by the public. Member states have to implement the EPBD2 by 2012-13.
- CLG is planning to publish an impact assessment to calculate the relative costs and benefits of rolling out EPCs to all non residential buildings later this year.
- Work is ongoing to improve the quality of the EPC and DEC assessment and accreditation schemes, which will include improving the training that energy assessors receive and a possible withdrawal of accreditation for poor performers.

Once this work is concluded, early roll-out would provide increased transparency and facilitate possible new policies to unlock emissions reduction potential in the non-residential sector. These approaches would complement the proposed new 'Pay As You Save' policy for the non-residential sector.

Even before widespread roll-out, it is important to note that there is currently an implementation risk given evidence of a high level of non-compliance, with the majority of commercial buildings up for sale or re-let not having an EPC.[2] Proposed mandating that property advertisements carry the EPC rating will help to address this, but stricter enforcement by local trading standards or alternative compliance mechanisms should also be considered to ensure that existing and any future legislation is implemented.

Zero carbon non-residential buildings

There has been progress towards the target that new non-residential buildings in England should be zero carbon from 2019, with both schools and the public sector required to comply from 2016 and 2018 respectively. The earlier targets for public sector buildings reflect the Government's focus to lead emissions mitigation by example. The Devolved Administrations have set their own targets (Box 3.4).

CLG has proposed that zero carbon standards for the non-residential sector should, where possible, be consistent with zero carbon homes through the adoption of the same three tier hierarchy of energy efficiency, followed by on-site or linked low/zero carbon technologies and finally off-site measures. Due to the timescales involved, the carbon impact of this policy will be negligible during the first three carbon budgets but more important in the long term.

2 National Energy Services monitoring of commercial buildings recorded that 61% of commercial building sampled in February 2010 were marketed without an EPC rating.

New incentives for SME energy efficiency improvement

The Committee has highlighted the significant opportunity for emissions reduction from SMEs and suggested a number of high-level options to strengthen incentives in this area:

- Provision of more financial support,
- Extending the new residential sector delivery model to cover SMEs,
- Mandating implementation of measures.

A programme of work is underway in DECC to assess these alternative policies, with proposals due later this year. Their latest assessment suggests that SMEs and more broadly the sectors not covered by policy levers (EU ETS, CCA and CRC) currently account for 49 $MtCO_2$ emissions (30% of which is in industry, the rest in non-residential buildings), with the potential for cost-effective abatement of 2.7 $MtCO_2$ by 2020. Some of this potential will be accessed by policy measures already planned, notably the RHI.

We will provide a further assessment of opportunities in this area following the publication of proposals by DECC.

Carbon Reduction Commitment Energy Efficiency Scheme

A key lever for reducing emissions in non-residential buildings is the Carbon Reduction Commitment Energy Efficiency Scheme (CRC), which took effect in April 2010. The CRC caps the emissions of large non energy intensive companies and public sector buildings. The Committee has been asked by the Government to provide advice on the appropriate level of the second phase cap (2013-18) and other aspects of the CRC:

- The Committee will provide an indicative assessment of the cap, which will subsequently need to be firmed up based on further analysis of baseline emissions and the abatement potential in sectors covered by the CRC.
- Also as part of the review, the role of the safety valve – which allows participants to buy allowances from the EU ETS – beyond the introductory phase will be considered and complementary measures to support emissions reductions (e.g. information and financing).

The Committee will report its advice on the level of the CRC cap in September 2010.

Public sector buildings

There is a significant opportunity for emissions reduction in public sector buildings. It is important that the government and public authorities show leadership in addressing their own emissions and realise what can be significant monetary savings from energy efficiency improvements. For these reasons, we proposed that all cost-effective emissions reduction potential in public buildings covered by the CRC should be unlocked by 2018.

Recent progress includes:

- The commitment by the new Government to reduce emissions from central government by 10% over the next year.
- The ongoing low carbon review of the public sector is expected to identify energy efficiency improvements in order to deliver annual energy savings of £300m in 2012/13. This will support the take up of cost effective measures in the short and medium term.
- Under the Departmental Carbon Reduction Delivery Plans (CRDPs), all major central government departments have been given responsibility for reducing their share of emissions in the total carbon budget. This covers emissions from their own estates and operations, as well as emissions from relevant public sector bodies.
- The first stage of the BEEP (Building Energy Efficiency Programme) launched in 2009 by the London Development Agency saw the retrofit of 42 existing public sector buildings in London with energy efficiency measures. Average CO_2 reductions of 27% were achieved with annual energy savings totalling £1m. The scheme is designed to accelerate the pace of retrofit with a 2025 target to cover over 2,000 existing public sector buildings, and will be rolled out to other areas in the country.

Given this progress on commitments, as well as positive developments in the Devolved Administrations (Box 3.5), the challenge now is to move from setting ambitious targets to accelerated delivery.

Box 3.5 Devolved Administrations own emissions

Scotland

The Scottish Government's 2009 Carbon Management Plan is currently under review to take account of a substantial increase in the size and diversity of the Scottish Government estate. A revised plan will be available in the spring of 2011, whilst a progress report setting out achievements against the list of carbon reduction projects set out in the 2009 plan will be produced in September 2010.

Wales

The Welsh Assembly Government has developed a £2.1m investment plan for its own estate for the period 2008-11 covering energy efficiency measures and renewable technologies, new boiler plant, LED lighting and increased lighting control, double-glazing, high efficiency hand dryers and automatic metering. The Government is also working towards achieving the highest level of environmental management system certification. Across the built estate CO_2 emissions fell 5% in 2008/09 compared to the previous year. In Cathays Park, the largest office of the estate, emissions fell 11% over the same period.

Northern Ireland

Northern Ireland, as well as having a target to make the public sector estate carbon neutral by 2015, has set various energy efficiency and energy use targets for the public sector and reports against these each year. The latest annual report finds that while the target to source at least 10% of renewables has been overachieved (at 19%), progress on energy efficiency and total carbon emissions must accelerate in the next few years to meet targets.

5. Emissions from industry

Opportunities for emissions reduction

Currently iron and steel, offshore oil and gas production, cement and chemicals account for nearly half of industry emissions. Emissions in this sector include direct CO_2 and other GHGs produced from chemical reactions in industrial processes such as cement manufacture.

Our previous assessment noted that industrial sector abatement potential is difficult to characterise due to:

- Uncertainties surrounding the future shape of industry in the UK, including future demand for products and what proportion of this demand will be met by manufacturing located in the UK.
- Uncertainties surrounding the options for reducing industry emissions, such as future technologies and radical process changes.
- The evidence base on scope for emissions reduction in industry (primarily the "ENUSIM" model) had not been comprehensively updated for a number of years.

In order to address these challenges, we have recently worked with DECC to improve the evidence base through updating the ENUSIM model in some key sectors. This has resulted in some improvement in modelling capability and transparency.

However, the accuracy of data underpinning ENUSIM, including the recent update, is reliant on the often limited ability and/or willingness (given commercial considerations) of industry to provide information regarding abatement opportunities. Other shortcomings in the current form of the model include under-representation of fuel switching and future technological options for abatement.

Therefore further improvements to the evidence base are required to accurately assess the likely potential for abatement across industry.

Policies to encourage emissions reduction

There are three key policy instruments for reducing industry emissions:

- **Climate Change Agreements (CCAs).** These cover energy-intensive industries and set targets for emissions reduction (Box 3.6). It is not clear how much of the emissions reduction in industry can be attributed to CCAs, or the scope for future emissions reduction given problems with the current evidence base (see above).
- **EU ETS.** Approximately two-thirds of industry emissions are covered by the EU ETS, of which around half are also covered by CCAs. Our working assumption has been that the combination of energy-intensive production processes and a carbon price would provide sufficient incentives for energy efficiency improvement and investment in low-carbon process technology. While there is some evidence that the EU ETS has played a role in guiding investment decisions, the incentives are diluted by some aspects of its design (Box 3.7).
- **The Renewable Heat Incentive (RHI).** The RHI as currently proposed will incentivise renewable heat use in industry (see Section 6). Projected abatement for industry under the RHI scheme is 7.2.MtCO_2 by 2020, primarily from the use of biomass boilers.

Box 3.6 Climate Change Agreements

For energy-intensive industries, the CCAs are a key part of the policy framework for reducing emissions. Owing to the multiple influences on industry energy use, such as energy prices and the demand for products, measuring the effectiveness of CCAs is extremely complex, and different studies make conflicting estimates for emissions reductions in industry. The common message emerging from these reports is that there is a great deal of uncertainty surrounding any estimate of emissions savings.

CCAs were introduced in 2001 alongside the Climate Change Levy (CCL) in recognition of the need to maintain the competitiveness of energy-intensive sectors. They provide businesses in certain energy intensive sectors (including aluminium, cement, ceramics, chemicals, food and drink, foundries, glass, non-ferrous metals, paper, steel – approximately half of industrial sector emissions) with an 80% discount on the CCL in return for improving energy efficiency and/or reducing emissions. In the June 2010 budget, the Government confirmed plans to reduce the discount to 65%. Sector targets were set with a view to achieving 60% of the difference between 'business as usual' and a scenario in which all cost effective measures had been achieved.

The vast majority of sectors met their annual carbon reduction targets (36 of 52 sectors in the most recent review period), with many sectors over-complying particularly in the early stages of the scheme. A study by the National Audit Office (2007) argued that this early overachievement was as much a result of weak targets as it was of efficiency improvements. Subsequently the Environmental Audit Committee (2008) recommended that lax targets early in the scheme meant that CCA targets needed to be regularly reviewed, to ensure they were continually binding. DECC has responded to this concern through a tightening of the targets by 4.4% for 2010. The current CCAs expire in 2013 and in March 2010, the government published a consultation on draft agreements and scheme rules for new CCAs.

Box 3.7 EU ETS and industry

The EU ETS is now in the second phase (2008-2012) of operation. The first phase of the scheme (2005-2007) and to some extent the current phase have been viewed as a learning period in which the design of the scheme can be optimised to achieve emissions reductions most effectively.

Across the EU, verified emissions in the EU ETS have been consistently below the allocation. For example, in phase 1 annual verified emissions were lower than allocations by around 120 $MtCO_2$ (6%). The recession has exacerbated over-allocation (in 2009 verified emissions were 94$MtCO_2$ or 4.8% lower than allocation).

The resulting lower carbon price has dampened incentives for implementation of measures to reduce emissions, although some incentives may have been provided through non-financial levers (e.g. raising awareness at the board level).

Incentives may have diminished further for a number of reasons:

- **Free allocation:** A low level of auctioning in Phase 1 and 2 may have led to windfall profits for organisations (if the price of allowances is passed through to consumers). This can also dilute the incentives for industry to invest in lower-carbon technology.
- **Distribution of allowances:** The basis for allocation of allowances has been much disputed. Even for a scheme with an appropriate level of ambition overall, the basis for allocations may impact on incentives to reduce emissions.
- **New entrant reserve:** Free allocations given by one Member State can adversely affect the competitiveness of new entrants elsewhere, and so tends to be mirrored by others, with potential distortions to investment decisions.
- **Closure rules:** Retiring allowances following the closure of an installation may provide an incentive to keep outgoing and inefficient plant open longer.

- **Banking:** The banking of emissions from phase 2 to phase 3 was introduced to overcome price volatility such as that experienced at the end of phase 1. However, this can carry through the impact of over-allocation, reducing prices in the next phase.
- **Uncertain forward prices:** An uncertain longer-term framework for the scheme may reduce the impact of the scheme on investment decisions, particularly those investments involving longer pay back periods.

Phase 3 of the scheme (2013-2020) attempts to overcome some of these issues by making changes to the design of the scheme, including an overall EU cap on emissions that is progressively tightened, a move towards auctioning (up to 50% of allowances), benchmarking of allowances and a limit on the use of project credits from outside the EU (at most, 50% of the reductions required by the scheme).

The Committee's future approach to industry

Going forward, our approach to monitoring progress reducing industry emissions will be based on three pillars:

- We will work with DECC to continue to improve the existing evidence base. Depending on progress here, and available data, we may set out indicators for progress on specific measures.
- We will assess more fundamental options for reducing industry emissions as part of advice on the fourth budget to be published before the end of 2010. A number of important opportunities for the industrial sector are likely to develop in the 2020s, including the application of CCS in industry, low-carbon process and product innovations and further options for the provision of low-carbon heat through biomass and CHP.
- In future progress reports we will consider effectiveness of the main policy instruments in this sector, including CCAs, CCLs, and EU ETS.

6. Low carbon and renewable heat

We have previously presented analysis which showed the need for significantly increased penetration of renewable heat in the period to 2020 to meet carbon budgets, and to prepare for deeper cuts in heat emissions through the 2020s. In particular, the analysis suggested the Government's ambition to increase renewable heat penetration to 12% by 2020 would make a useful contribution to carbon budgets, notwithstanding that meeting this target would be expensive at the margin.

We highlighted financial and other incentives as being key areas to address in developing the policy framework for renewable heat:

- Given the cost characteristics of renewable heat together with the lack of a carbon price in most of the heat sector, a financial support mechanism will be required.
- Complementary measures are needed to address other barriers such as low awareness, supply chains and lack of adequately trained suppliers and installers.

The draft Renewable Heat Incentive (RHI) document published in February 2010 sets out proposals to support a range of renewable heat technologies such as heat pumps and biomass boilers (Box 3.8). The level of ambition for deployment in the proposals is broadly consistent with our analysis, although further consideration of the exact levels of support for specific technologies and delivery mechanisms (including the balance between capital grants and recurrent payments) may be required to ensure cost-effectiveness and to maximise carbon savings.

Box 3.8 Renewable Heat Incentive proposals

In order to incentivise the uptake of renewable options, the proposed RHI provides a tariff that aims to make investing in renewables financially attractive. The tariff levels have been set with a view to compensating renewable heat generators for the following:

- **Higher financial costs:** This is the difference in financial costs (capital and operating) associated with renewable technologies, compared with a `reference technology` of a gas boiler (except for small scale biomass, where the reference technology is oil heating).
- **Barriers costs:** This includes for example the disruption of digging up gardens to install a ground source heat pump.
- **The opportunity cost of capital and level of risk:** This is calculated as an investment return on the difference in capital costs between renewable heat and the reference technology annuitized at 12% for all technologies (except solar, which is 6%).

For example, an off-grid 3-bed semi-detached home installing a biomass boiler to replace an old oil fired boiler could get an RHI payment of around £1,000 a year, with additional fuel savings of up to £500 per year (depending on the cost of the pellets/wood chips). Pay-back could be as short as three or four years.

In the residential sector, heat demand will be deemed (as opposed to metered), based on the assumption that some basic energy efficiency measures will be taken up. However, this only assumes 125mm of loft insulation (as opposed to a standard of 270mm under CERT) and no evidence is required that minimum levels of energy efficiency have been achieved. There are no incentives for more difficult measures such as solid wall insulation and an inefficient solid walled property will get a much higher level of RHI payment than an energy efficient home. There is no link of RHI payments to energy efficiency in non-residential sectors.

By 2020, the annual cost of the RHI is expected to be between £0.8bn and £1.8 bn. The RHI did not commit to specific financing arrangements but if the costs were passed on to energy consumers, annual domestic fuel bills could increase by 14% (£104) and industrial bills by 20%.

Box 3.9 Renewable heat activities in the Devolved Administrations

Scotland

Scotland’s Renewable Heat Action Plan outlines a target for 11% of heat to be met from renewable sources by 2020. It is envisaged that meeting this target will require 2.07 GW_{th} installed capacity by 2020. By March 2009 there was an estimated 233MW_{th} of renewable heat capacity in Scotland. To accelerate progress and help build the industry ahead of the introduction of the proposed RHI, the Plan outlines a number of supporting actions to be taken across a range of areas. These address labour/skills barriers in the workforce, the provision of advice and assistance to emerging and new-start supply chain companies, improving wood fuel supply forecasts and supporting investment in renewable heat (e.g. through the Scottish Biomass Heat Scheme which provides grants for the installation of biomass heating systems in business premises and district heating demonstrators). Energy-from-waste also has an important part to play. Scotland’s Zero Waste Plan highlights that energy-from-waste could generate enough heat for 110,000 homes and make a significant contribution towards Scotland’s renewable heat target.

Wales

The Welsh Assembly Government's Energy Policy Statement published in March 2010 outlines the aim for virtually all Wales' local energy needs, including heat, to be met from low carbon electricity generation by 2050. The Statement builds on earlier consultations on a Renewable Energy Route Map (2008) and Bioenergy Action Plan (2009). The latter outlines the aim to secure annual generation of 2.5 TWh of usable heat energy from renewable biomass by 2020 via a range of actions to stimulate demand for bioenergy. These include public awareness campaigns, the inclusion of biomass in demonstration zero carbon buildings, and providing a heat map to identify and highlight CHP opportunities. Financial support includes funding for local authorities to collect and treat food waste, funding for the establishment of anaerobic digestion plants and the Wood Energy Business Scheme, which aims to install 40MW of renewable heat capacity over its 4 year operation (2009-2013).

Northern Ireland

The proposed RHI does not apply to Northern Ireland and the utility regulator is planning to work with the Department of Trade, Enterprise and Investment (DETI) to develop its own policies in relation to renewable heat in 2010/11. The Draft Strategic Energy Framework for Northern Ireland consultation, published in July 2009 and due for approval in late summer 2010, proposes a 10% renewable heat target for 2020. It also outlines DETI's commitment to urgently consider how financial support for significantly increased levels of renewable heat can be provided, and whether support is needed at a variety of points along the supply chain.

The RHI includes proposals for certification and standards for suppliers and equipment to address non-financial barriers to renewable heat uptake, such as lack of trust and certainty in the market. However, it does not address in detail the current lack of awareness of renewable heat technologies, which will require promotion and marketing to ensure that potential customers are aware of their benefits. The Devolved Administrations have recently announced additional activities to address this and other issues such as training and skills (Box 3.9).

The RHI proposals provide only a limited incentive to improve energy efficiency. Given the important role of energy efficiency improvement for carbon budgets, and the fact that renewable heat is more cost-effective when installed in energy efficient buildings, it is desirable that stronger incentives for energy efficiency improvement should be introduced as part of the RHI. Amongst possible options are conditionality of the RHI on a certain level of energy performance (e.g. by mandating all cost-effective measures) and offering some RHI payments in the form of energy efficiency vouchers.

District heating and combined heat and power

The HEMS also identifies a clear role for district heating and Combined Heat and Power (CHP) in decarbonising heat supply:

- Up to 16 GW_e of conventional and biomass CHP could be operational by 2020.
- A heat market to be developed at a community scale (i.e. local district heating networks) as well as at a larger industrial/commercial scale.

A new enabling framework is to be established including a Heat Market Forum (focusing on consumer protection), a national heat map, and local authority partnerships.

In considering a potential role for CHP and district heating a number of factors are important:

- The timing of heat decarbonisation in the context of the path towards meeting the UK's 80% emissions reduction target, and the implied need to transition from conventional to low-carbon CHP.
- The proximity of heat loads to potential sites for low-carbon CHP (e.g. the extent to which nuclear and CCS power stations near to coasts could usefully be used to meet local heat demand).
- The availability of sustainable bioenergy (both locally and more generally) to support this transition.
- The costs and suitability of alternative forms of renewable heat (e.g. heat pumps).

The Committee will provide a full assessment of the role of CHP and district heating as part of its advice on the fourth budget to be published by the end of 2010.

7. Departmental carbon reduction delivery plans

In March 2010, a suite of departmental carbon reduction delivery plans (CRDPs) was published which set out how each government department will reduce emissions in the sectors where they have an influence. The buildings and industry sectors are covered by the CRDPs of CLG and DECC. The departmental plans also include a number of key indicators and policy milestones that Government will use to track progress towards carbon budgets.

The DECC and CLG plans are broadly consistent with the Committee's recommendation and indicator framework in terms of coverage and high-level ambition, although there is scope for strengthening in key areas (Box 3.10):

- **Defining indicators:** there are no trajectories in the plans for specific measures (the approach here is to simply list a desired direction of travel: upwards or downwards), with the only trajectory being the high-level emissions path set out in the Low Carbon Transition Plan. Therefore, it is difficult to assess the level of change that should be observed against each indicator to be consistent with carbon budgets. In order to address this, trajectories for some key indicators should be included, similar to the Committee's indicator framework (Table 3.1).
- **Ensuring sufficient ambition:** As noted in Section 3 above, DECC's level of ambition on cavity walls is substantially lower than the Committee's trajectory set out in 2009. While we understand that DECC is continuing to build the evidence base in this area, our analysis suggests that a higher level of ambition for improvements in this section of the housing stock is important for achieving carbon budgets.
- **Committing to new approaches and policies:** We have highlighted the need for new approaches to reducing emissions from buildings and industry (finalising the framework for residential energy efficiency improvement, roll-out of EPCs and DECs, new approaches to SMEs, finalising the RHI, etc.). Policy development is crucial to unlocking the emissions reduction potential that we have identified, and this should be reflected through including policy milestones in the departmental delivery plans.

We will continue to consider progress against our indicators for implementation of measures and policy milestones in our annual reports to Parliament.

Box 3.10 Departmental indicator framework

Residential

In terms of individual indicators the departmental indicator framework is broadly consistent with the indicators set out by the Committee in the 2009 progress report and in some areas more indicators are being tracked. Additional indicators include:

- All new homes to be zero carbon from 2016,
- All homes to have a smart meter by 2020.

The Committee recognises the importance of these policies but as their impact will be relatively small in the first three budget periods, we have not included these measures in our indicator set.

The Committee's framework includes additional indicators that are not being tracked by the government framework. These are:

- Every house offered a whole house energy audit by 2017,
- New financing mechanisms have been piloted, evaluated and legislated by 2011,
- A post CERT delivery framework legislation is in place by 2011.

In terms of indicators relating to insulation, the Government's policy milestone of 'all lofts and cavities to be filled where feasible by 2015' differs significantly from the Committee's. For cavities, 'where feasible' assumes a significantly lower level of ambition than the Committee's (4 million versus 8 million) but higher CO_2 savings per measure.

The LCTP set out a trajectory for a 29% reduction in non-traded sector emissions across the first three budget periods. The HEMS set out at a high-level how the trajectory would be met but as noted above, implementation details need to be developed before we can assess the potential effectiveness of the policy.

Non-residential buildings and industry

The departmental indicator framework combines non-traded non-residential buildings and industry indicators into one category called "workplaces" which encompasses non-traded energy use from commercial operations and industry. Other traded sector indicators are also highlighted.

For non-domestic buildings, the departmental framework is less specific than the Committee. For example:

- The Government's lists a future indicator of improvement in EPC ratings, with no date or indication of desired trend.
- The Committee's indicators include a minimum EPC of F or higher by 2017.

In its workplaces section, the departmental indicator set includes additional policy milestones such as CCAs and Feed in Tariffs (FITs).

- For industry, the Committee is currently carrying out further analysis and may add further indicators in the future, such as performance against CCAs.
- As FITs will only deliver a low level of traded sector abatement (around 1 $MtCO_2$ by 2020), we have not included them and focused on renewable measures with a larger abatement potential (such as the RHI).

Table 3.1 The Committee's buildings and industry indicators

		Budget 1	Budget 2	Budget 3	2009 trajectory	2009 outturn (compared to 2007)
All buildings and industry						
Headline indicators						
CO_2 emissions (% change on 2007)*	direct	-9%	-11%	-15%	-8%	-11%
	indirect**	-11%	-28%	-58%	-2%	-15%
Final energy consumption (% change on 2007)	non-electricity	-10%	-18%	-23%	-0%	-6%
	electricity (centrally produced)***	-8%	-7%	-5%	-4%	-6%
	electricity (autogen included)***	-4%	-9%	-13%	-5%	-7%
Residential buildings						
Headline indicators						
CO_2 emissions (indicative minimum % change on 2007)*	direct	-6%	-18%	-20%	3%	-2%
	indirect**	-11%	-23%	-53%	-6%	-10%
Final energy consumption (indicative minimum % change on 2007)	non-electricity	-6%	-18%	-19%	4%	-2%
	electricity (centrally produced)***	-5%	-4%	-3%	-3%	-1%
	electricity (autogen included)***	-5%	-4%	-3%	-3%	-1%
Supporting indicators						
Uptake of solid wall insulation (million homes, total additional installations compared to 2007 levels)		0.5	1.2	2.3	0.1	(approx 26,000)
Uptake of loft insulation (up to and including 100mm) (million homes, total additional installations compared to 2007 levels)		2.3	5.6	5.6	All lofts: 1.0	Professional: 1.6, DIY: 0.86
Uptake of loft insulation (100mm +) (million homes, total additional installations compared to 2007 levels)		2.0	4.9	4.9		
Uptake of cavity wall insulation (million homes, total additional installations compared to 2007 levels)		3.9	8.1	8.1	1.1	1.1
Uptake of energy efficient boilers (million homes, total additional installations compared to 2007 levels)		4.9	9.3	12.6	2.0	2.3
Uptake of energy efficient appliances - Cold A++ rated (% of stock)		3%	18%	45%	0%	0%

Table 3.1 The Committee's buildings and industry indicators

	Budget 1	Budget 2	Budget 3	2009 trajectory	2009 outturn (compared to 2007)
Uptake of energy efficient appliances – Wet A+ Rated (% of stock)	16%	40%	58%	7%	~6%
Every house offered whole-house energy audit		by 2017			n/a
Heat and Energy Saving Strategy finalised	2009				Household Energy Management Strategy published March 2010
New financing mechanism pilots operate and are evaluated	2011				PAYS pilots launched in 2010
New financing mechanism budgeted and legislation in place if necessary	2011				Commitment to Energy Bill by new government
Post CERT delivery framework legislation in place	2011				n/a
Other drivers					
Average SAP rating, Implementation of behavioural measures, Population (by age), Number of households (by type – building and occupants), Real Household disposable income, Real electricity prices, Real gas prices, Appliance ownership, Weather				See technical annex for these indicators	

*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.

**These changes are based on centrally produced 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 auto generated electricity, and in centrally produced electricity only.

Notes:

1. Numbers indicate amount in last year of budget period i.e. 2012, 2017, 2022.
2. While we present outturn vs. trajectory figures for 2009, it is not our expectation that our trajectories will be achieved precisely for every indicator in every year. There may be some year to year variation, which is acceptable. Similarly it may be the case that some indicators are not met while others are over-achieved; this may still on average constitute sufficient progress. A problem will be signalled however if under-achievement persists, if a large number of indicators are off-track or if specific indicators or milestones which are key to unlocking abatement in the longer term are not met.
3. There have been revisions to the buildings and industry indicator table presented in CCC's 2009 progress report.

Key: Headline indicators · Implementation indicators · Milestones · Other drivers

Table 3.1 The Committee's buildings and industry indicators

		Budget 1	Budget 2	Budget 3	2009 trajectory	2009 outturn (compared to 2007)
Non-residential buildings						
Headline indicators						
CO_2 emissions (indicative minimum % change on 2007)*	direct	6%	2%	-3%	10%	1%
	indirect**	-9%	-22%	-51%	-4%	-13%
Final energy consumption (indicative minimum % change on 2007)	non-electricity	-4%	-8%	-13%	-2%	1%
	electricity (centrally produced)***	-1%	-1%	-1%	0%	-5%
	electricity (autogen included)***	-1%	-1%	-1%	0%	-5%
Supporting indicators						
Develop policy on SMEs		by October 2010				Analysis of policy options underway, proposals due end 2010
Government decision on the following recommendations for EPCs and DECs:		by October 2010				
• All non-residential buildings to have an EPC			by 2017			Impact Assessment to be published Autumn 2010
• All non-residential buildings to have a minimum EPC rating of F or higher				by 2020		Impact Assessment to be published Autumn 2010
• Roll out of DECs to non-public buildings			by 2017			Consultation published March 2010
All public buildings covered by CRC to realise all cost-effective emissions change potential			by 2018	by 2018		n/a for 2009
Other drivers						
Emissions and fuel consumption by subsector, GVA vs. GVA for each sub-sector, Electricty and gas prices					See technical annex for these indicators	
Industry						
Headline indicators						
CO_2 emissions (indicative minimum % change on 2007)*	direct	-15%	-2%	8%	-10%	-21%
	indirect**	-12%	-35%	-66%	-15%	-23%

Table 3.1 The Committee's buildings and industry indicators

		Budget 1	Budget 2	Budget 3	2009 trajectory	2009 outturn (compared to 2007)
Final energy consumption (indicative minimum % change on 2007)	non-electricity	-20%	-21%	-19%	-6%	-18%
	electricity (centrally produced)***	-16%	-11%	-5%	-11%	-13%
	electricity (autogen included)***	-6%	-18%	-30%	-9%	-14%
Other drivers						
Emissions and fuel consumption by subsector, GVA vs. GVA for each sub-sector, electricty and gas prices					See technical annex for these indicators	
Renewable heat						
Headline indicators						
Renewable heat penetration		1%	5%	12% in 2020	n/a	n/a
Supporting indicators						
Renewable Heat Incentive in operation		from April 2011			n/a	RHI proposals published in February 2010.
Other drivers						
Uptake and costs of renewable heat technolgys: Biomass boilers, Solar thermal, Heat Pumps, District Heating					See technical annex for these indicators	

*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.

**These changes are based on centrally produced 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 auto generated electricity, and in centrally produced electricity only.

Notes:

1. Numbers indicate amount in last year of budget period i.e. 2012, 2017, 2022.
2. While we present outturn vs. trajectory figures for 2009, it is not our expectation that our trajectories will be achieved precisely for every indicator in every year. There may be some year to year variation, which is acceptable. Similarly it may be the case that some indicators are not met while others are over-achieved; this may still on average constitute sufficient progress. A problem will be signalled however if under-achievement persists, if a large number of indicators are off-track or if specific indicators or milestones which are key to unlocking abatement in the longer term are not met.
3. There have been revisions to the buildings and industry indicator table presented in CCC's 2009 progress report.

Key: Headline indicators | Implementation indicators | Milestones | Other drivers