

The CRC Energy Efficiency Scheme – advice to Government on the second phase



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Foreword

In January 2010, the Committee was asked by Government and the Devolved Administrations to provide advice on the level of the cap for the second phase of the Carbon Reduction Commitment Energy Efficiency Scheme (CRC).

The CRC specifically targets the emissions associated with electricity and heat use in large public and private sector organisations, and covers around 10% of the UK's greenhouse gas emissions. It was introduced because evidence suggested that existing policy instruments aimed at improving energy efficiency had been largely ineffective in sectors covered by the CRC. The CRC is designed to provide financial and reputational incentives for participants, and therefore to raise the corporate profile of energy efficiency improvement.

One clear conclusion of our analysis is that there is significant potential for emissions reductions in the sectors covered by the CRC; which could see a reduction of up to 30% by 2017. This justifies an instrument to provide incentives for energy efficiency improvement in sectors covered by the CRC, and could be built in to the cap proposed for the second phase.

However, we have also concluded that the scheme is already complex, and that introducing a cap and the auctioning of allowances would add to this complexity, with limited benefit in terms of strengthening incentives for energy efficiency improvement. Therefore we consider alternative options for design of the scheme, and suggest that it is appropriate to continue with the current design rather than introduce a cap. This current design ensures that organisations and companies covered by the scheme face an additional fixed marginal price of carbon (beyond that created by the EU ETS and the Climate Change Levy) and have clear incentives to improve their carbon efficiency; but it avoids the complexity of a cap and a fluctuating price, which could prove very volatile given that the precise scale of abatement opportunity is unclear.

In considering the CRC, it has become apparent to us that there is a very complex policy landscape covering the commercial, public and industrial sectors. For example, participants in the CRC are subject to the Climate Change Levy and the EU ETS. Beyond the CRC, energy intensive companies are covered both by the EU ETS and Climate Change Agreements. At the other end of the spectrum, there are only weak incentives for SMEs to improve their energy efficiency.

Given this complexity, we recommend that the Government undertakes a review of the scope for streamlining policies in order to provide appropriate incentives for energy efficiency improvement without unnecessarily burdening companies and organisations.

We will continue to assess progress in reducing emissions in the non-residential sectors as part of our broader monitoring, with our next report to Parliament due to be published in June 2011.

I would like to thank the Secretariat for their excellent support in producing this report, our fourth of 2010.



Lord Adair Turner

Chair

The Committee



Lord Adair Turner, Chair

Lord Turner of Ecchinswell is the Chair of the Committee on Climate Change and Chair of the Financial Services Authority. He has previously been Chair at the Low Pay Commission, Chair at the Pension Commission, and Director-General of the Confederation of British Industry (CBI).



David Kennedy, Chief Executive

David Kennedy is the Chief Executive of the Committee on Climate Change. Previously he worked on energy strategy at the World Bank, and the design of infrastructure investment projects at the European Bank for Reconstruction and Development. He has a PhD in economics from the London School of Economics.



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Dr Samuel Fankhauser is a Principal Research Fellow at the Grantham Research Institute on Climate Change at the London School of Economics. He is a former Deputy Chief Economist of the European Bank for Reconstruction and Development and former Managing Director (Strategic Advice) at IDEACarbon.



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Professor Sir Brian Hoskins, CBE, FRS is the Director of the Grantham Institute for Climate Change at Imperial College and Professor of Meteorology at the University of Reading. He is a Royal Society Research Professor and is also a member of the National Science Academies of the USA and China.



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Professor Julia King CBE FEng is Vice-Chancellor of Aston University. She led the 'King Review' for HM Treasury in 2007/8 on decarbonising road transport. She was formerly Director of Advanced Engineering for the Rolls-Royce industrial businesses. Julia is one of the UK's Business Ambassadors, supporting UK companies and inward investment in low-carbon technologies.

**Lord John Krebs**

Professor Lord Krebs Kt FRS, is currently Principal of Jesus College Oxford. Previously, he held posts at the University of British Columbia, the University of Wales, and Oxford, where he was lecturer in Zoology, 1976-88, and Royal Society Research Professor, 1988-2005. From 1994-1999, he was Chief Executive of the Natural Environment Research Council and, from 2000-2005, Chairman of the Food Standards Agency. He is a member of the U.S. National Academy of Sciences. He is chairman of the House of Lords Science & Technology Select Committee.

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The Committee would like to thank:

The core team that prepared the analysis for the report. This was led by David Kennedy and included: Russell Bishop, Ute Collier, Adrian Gault and Indra Thillainathan.

Other members of the CCC secretariat who contributed to the report: Swati Khare-Zodgekar, Sarah Naghi, Emily Towers and Jo Wilson.

A number of organisations for their support, including: CBI, Carbon Trust, DECC, Ecofys, Entec UK, Environment Agency, and SKM Enviros.

A wide range of stakeholders who engaged with us, or met with the CCC bilaterally.

Executive summary

The Carbon Reduction Commitment Energy Efficiency Scheme (CRC), introduced in April 2010, is aimed at cutting emissions associated with electricity and heat use in large public and private sector organisations. It covers around 10% of the UK's greenhouse gas emissions.

Under the Climate Change Act 2008, the Committee is required to give advice on any new cap and trade scheme. In this context, the Government has requested the Committee to advise on the level of the cap for the second phase of the CRC covering the period 2013-17.

In the July 2010 Annual Energy Statement, the Government declared its intention to *'keep the operation of this scheme under active review with a particular eye on simplifying it and ensuring it properly incentivises those who do most to improve energy efficiency.'*

In this report we respond to the Government's request and suggest an indicative cap for the second phase of the CRC. Given the uncertainties and complexities associated with setting a cap, and the Government's objective to simplify the scheme, we consider whether an alternative design for the second phase, closer to that for the first phase, may be more appropriate. We also comment on other design aspects including the reform of revenue recycling and the treatment of renewable energy.

The key messages in the report are:

- If a cap were to be set for the second phase of the CRC, our analysis suggests that this could embody an annual emissions reduction of up to 4% resulting in an emissions reduction of around 30% by 2017 relative to 2008 levels.
- Given the uncertainty over the abatement potential due to the lack of a robust evidence base, there would be a risk of very low prices and limited financial incentives for energy efficiency improvement under a capped scheme. This risk could be mitigated through the setting of a reserve price in the auction of CRC allowances. The risk of very high prices is already addressed through a safety valve.

- However, introducing a cap and an auction mechanism would add an extra layer of complexity to what is already a very complex scheme, with no apparent benefits in terms of strengthening incentives for energy efficiency improvement.
- Therefore we recommend that alternative options are considered. In particular, extending the first phase design through the second phase (i.e. selling an unlimited number of allowances at a fixed price) would provide financial and reputational incentives equivalent to those under the proposed cap, but would avoid the extra complexity that an auction would entail.
- We also highlight options for a more fundamental redesign of the scheme (e.g. reforming revenue recycling, or dropping the need to purchase allowances). If these options were to be considered, it should be within the broader context of carbon price strengthening, and would require better evidence on the way that specific financial incentives under the CRC actually work in practice.



Executive summary – *continued*

We also make a number of specific recommendations relating to the treatment of public and private sectors, the approach to renewable energy, and the threshold for inclusion in the scheme:

Approach to public sector

- Notwithstanding cuts to public sector budgets, these should be set to allow up front investments in energy efficiency improvement.
- Even with adequate funding, public and private sectors differ in terms of potential for energy efficiency improvement and for managing energy intensity. The risk under the current scheme design is that there will be a transfer of funds between public and private sector organisations. In order to mitigate this risk, there should be separate league tables and revenue recycling for public and private sectors.

Approach to renewable energy

- Financial support for renewable energy should be primarily provided through targeted instruments other than the CRC (e.g. the Renewables Obligation and Feed in Tariffs for on-site power generation, and the Renewable Heat Incentive for heat). Therefore CRC allowances should be required to cover renewable energy generation including heat, as for generation from other sources. This is a departure from the current scheme design, which does not require allowances to cover renewable heat generation.
- However, the scheme does offer scope for providing reputational incentives to invest in renewable energy. Both renewable heat and electricity should be recognised in the context of the league tables.

Threshold for inclusion

- If a simplified design for the second phase were to be adopted, this would strengthen the case for lowering the threshold of the scheme. However, further work is required to establish whether related emissions reductions would justify the transaction costs, and whether there may be other schemes more appropriate for smaller firms.

We set out the analysis that underpins these conclusions in five sections:

1. **Context: emissions covered and interface with other policies**
2. **Analysis of emissions reduction potential and implications for setting the cap**
3. **Alternative options for design of the second phase of the scheme**
4. **Other design aspects**
5. **Next steps**

Section 1

1. Context: emissions covered and interface with other policies

In setting out the context for the CRC, we now consider:

- (i) Commercial, public sector and industry emissions trends
- (ii) Coverage of other policies and the rationale for the CRC
- (iii) Design and scope of the CRC

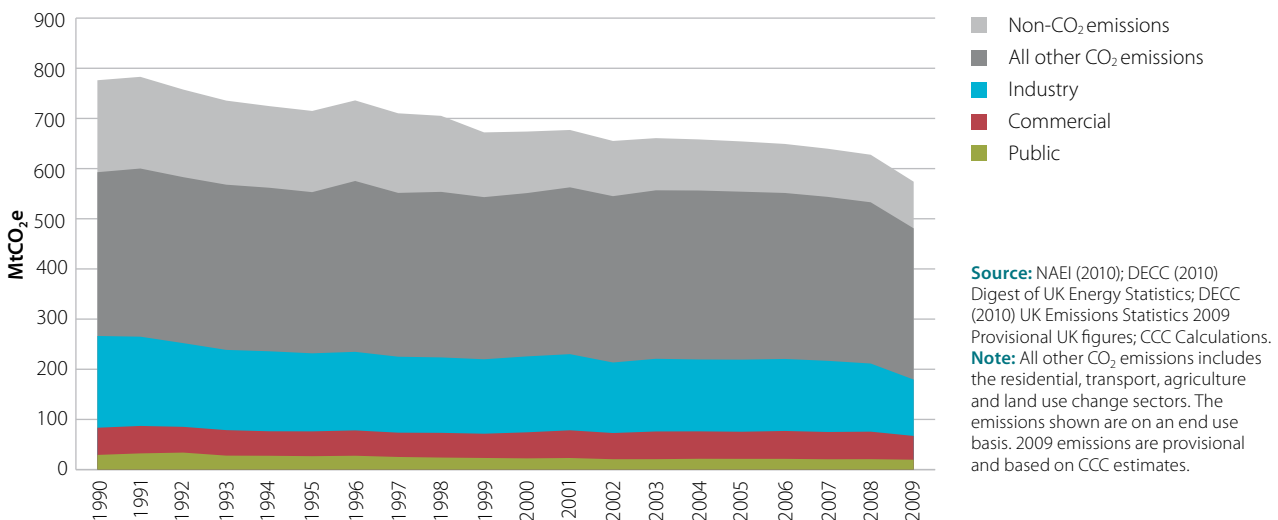
(i) Commercial, public sector and industry emissions trends

The CRC covers emissions from large commercial and public sector organisations, and non-energy intensive industry (see Box 1 and Section 1(iii)).

Emissions from commercial, public and industry sectors currently cover approximately a third of all UK GHG emissions. Public sector and industry emissions have fallen in the two decades prior to the recession, while commercial emissions remained broadly flat. The recession has had the largest impact on emissions in the commercial and industry sectors (Figure 1).

- Commercial sector emissions currently account for 9% of total UK emissions, are around 80% electricity related, and have been broadly flat since 1990. However, there were some reductions during the recession with our provisional estimates of CO₂ emissions suggesting a fall of 14% in 2009.
- Public sector emissions currently account for around 3% of total UK emissions, approximately half of which are electricity related. CO₂ emissions have fallen around 30% on 1990 levels but have been broadly constant since 2002. Public sector emissions were largely unaffected by the recession and a 5% fall in 2009 was principally due to a reduction in the carbon intensity of electricity.
- Industry emissions account for around a quarter of total UK emissions, with the majority of these being covered by the EU ETS. CO₂ emissions have fallen 26% between 1990 and 2008. Industrial emissions fell significantly in 2009, primarily due to the recession with non-electricity related emissions falling 17% and electricity related emissions falling approximately 19% based on our estimates.

Figure 1: CO₂ emissions from public, commercial and industry sectors and other UK emissions (1990-2009)



Section 1 – continued

Box 1 Key aspects of the CRC scheme

The CRC Energy Efficiency Scheme started in April 2010 and captures the emissions from large non-energy intensive companies (e.g. supermarket chains and commercial offices), public sector buildings (e.g. universities and hospitals) and the emissions of industry not covered by the EU ETS and Climate Change Agreements (CCA). Current estimates indicate that between 3,000–4,000 organisations will be covered by the scheme. Estimates by the Environment Agency suggest that just over two thirds of participants will be from the private sector, with the remainder from the public sector.

Inclusion in the scheme is a legal requirement for organisations that have at least one electricity meter settled on the half hourly market (a meter that records energy use every 30 minutes), and that consumed at least 6,000 MWh of electricity in 2008. This 6,000 MWh

consumption threshold approximates to an annual electricity bill of £750,000¹. While the threshold relates to electricity consumption only, the scheme also applies to gas use and other fuels such as fuel oil and Liquid Petroleum Gas (LPG).

The first year of the scheme is based on monitoring only. However, from April 2011 organisations will be required to purchase carbon allowances to cover their emissions. In the introductory phase, an unlimited number of allowances will be sold in the Government sale at a fixed price of £12/tCO₂, while the inclusion of a safety valve will enable participants to buy allowances² from the EU ETS should the price of CRC allowances rise above a certain level in the secondary market. The current intent is that the scheme will move to cap and trade from April 2013 onwards, with the number of allowances limited to reflect emissions targets for sectors in the CRC.

(ii) Coverage of other policies and the rationale for the CRC

There are three principal policy instruments in place to incentivise emissions reductions from the non-residential sectors:

- **The EU ETS** caps emissions from large energy intensive firms such as power generation, iron and steel, cement and chemicals, and covers around two thirds of UK industry CO₂ emissions. The current carbon price is around €15/tCO₂, and we project a carbon price for 2020 of the order €20-25/tCO₂.
- **The Climate Change Levy (CCL)** is charged to all non-residential energy users. It covers both electricity and non-electricity (primarily gas-fired heating related) related energy consumption, and based on the 2009 carbon intensities is equivalent to a carbon price of around €11/tCO₂.
- **Climate Change Agreements (CCAs)** cover energy intensive firms and give a discount on the CCL subject to the achievement of agreed energy efficiency/emissions targets.

¹ *Final Impact Assessment on the Order to implement the CRC Energy Efficiency Scheme (2010)*, DECC.

² Minimum safety valve price is set at £14/tCO₂, plus £300 cost per transaction.

These instruments provide incentives for energy intensive firms to reduce emissions through the EU ETS and CCAs. Incentives for non-energy intensive firms are provided indirectly through the EU ETS (in terms of its impact on electricity prices) and through the CCL.

However, research carried out by the Carbon Trust in 2005 suggested that incentives under these instruments were insufficient to unlock potential for energy efficiency improvement from non-energy intensive organisations (Box 2). Specifically, even with the EU ETS and the CCL, energy costs were a small proportion of an organisation's total costs and therefore did not provide the financial incentive to induce abatement. Combined with the presence of non-financial barriers, energy efficiency improvement was therefore given very little consideration in the broader corporate agenda. The Carbon Trust therefore

proposed that a new instrument should be introduced which would strengthen both financial and reputational incentives to unlock abatement potential.

Acknowledging the need to strengthen incentives, and following a broad consultation, the Government introduced the CRC in April 2010.

Box 2 Carbon Trust research on emissions reduction potential for CRC type participants

In large non-energy intensive organisations, which the CRC scheme targets, there is significant potential to reduce emissions through cost-effective energy efficiency measures. However, in their 2005 report, *'The UK Climate Change Programme: Potential evolution for business and the public sector'*, the Carbon Trust suggested that many organisations in this sector were giving very little consideration to reducing their energy consumption and associated emissions because:

- Energy costs make up a small proportion of total operating costs (e.g. 1-3%), with the EU ETS and CCL in turn accounting for a small proportion of total energy costs (e.g. one CRC participant we spoke to indicated that the cost of the CCL accounted for around 6% of their annual energy bill).

- Existing policies did not tackle the range of non-financial barriers prevalent in the sector:
 - **Hidden costs:** costs associated with adopting more efficient equipment e.g. perceived risks of poor performance, implementation issues, and the transaction costs of getting information and making informed judgements on the value of available opportunities.
 - **Market failures result in split incentives:** e.g. 'tenant/landlord' split, where the tenant pays the energy bill and control of energy services sits with the landlord.
 - **Organisational factors:** e.g. poor energy data, inertia, lack of senior management commitment to realising the financial/business benefits of decisions that improve energy efficiency.

Section 1 – continued

(iii) Design and scope of the CRC**Coverage of the scheme**

The CRC overlaps with the EU ETS (as regards electricity) and the CCL (as regards all fuel sources emissions) (Figures 2 and 3).

The scheme covers around a third of emissions from the non-residential buildings and industrial sectors, amounting to between 56 and 67 MtCO₂³ in 2008 (10% and 13% of total UK CO₂ emissions).

Assuming the 'high' case emissions coverage of 67 MtCO₂, in terms of sectoral emissions:

- The CRC covers more than two thirds (14 MtCO₂) of public sector emissions and more than half (31 MtCO₂) of commercial sector emissions (Figure 4).
- The parts of industry covered by the CRC are non-energy intensive and more comparable to commercial sector energy use rather than industry as a whole, and account for approximately a sixth of total industry emissions.
- The largest emitters in the commercial, public and industry sectors are supermarkets, local authorities and the water industry respectively (Box 3 and Figure B3).
- Electricity emissions account for around 70% of total emissions covered by the scheme (Figure 5). While these emissions are already capped at source by the EU ETS, it is still important to incentivise demand-side reductions given the significant and low cost abatement potential that is available.

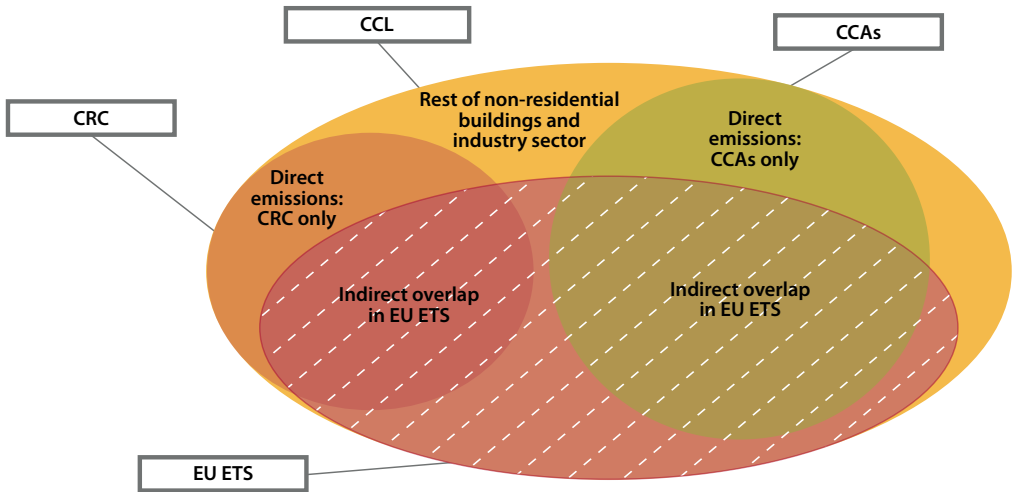
First phase design

The first phase of the scheme covers the period 2010-13 and requires participants both to report energy consumption and to purchase allowances to cover associated emissions:

- From April 2010, participants are required to monitor and report their energy supply and associated emissions to the Environment Agency, the scheme's administrator each year.
- From April 2011, participants will be required to purchase allowances for each tonne of CO₂ that is expected to be emitted during the year. An unlimited number of allowances can be bought in advance from the Government at a fixed price of £12/tCO₂, with subsequent sales and purchases through a secondary market (i.e. trading between scheme participants).
- A 'safety valve' allows CRC participants to buy further allowances from the scheme administrator should the price of CRC allowances in the secondary market rise above a certain level. In turn, where participants use the safety valve, the scheme administrator buys and cancels an equivalent number of European Union Allowances (EUAs) from the EU ETS. The price to scheme participants for such purchases is a minimum of £14/tCO₂, rising depending on the price in the wider carbon market.
- All revenue received from the sale of allowances via the Government sale will be recycled back to CRC participants (Box 4).

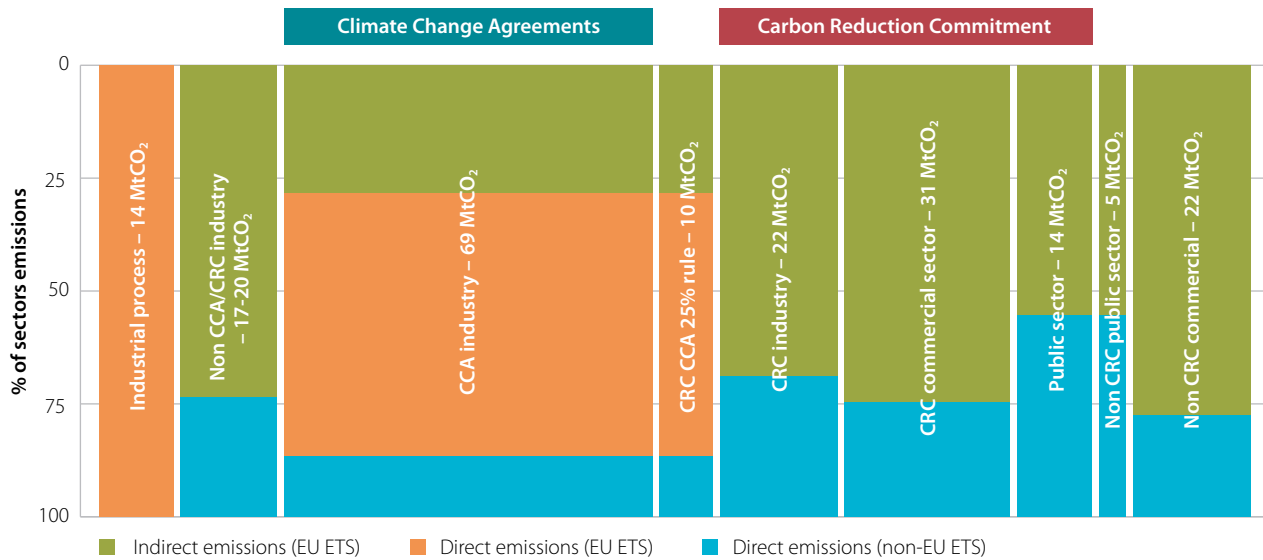
³ The range is due to uncertainty (see Box 6). Exact CRC emissions coverage will become known under the reporting requirements of the CRC.

Figure 2: Indicative key climate change policy coverage in the non-residential buildings and industry sectors



Source: DECC.
Note: The CCL covers all emissions in the non-residential and industry sectors.
 The EU ETS covers direct emissions primarily from industry and indirect emissions from all sectors through a cap on power supply. This diagram is indicative only and not to scale.

Figure 3: Detailed climate change policy coverage in the non-residential buildings and industry sectors (2008)



Source: NAEI (2010); SKM Enviro (2010); DECC (2010); CCC calculations.
Notes: Each segment represents different parts of non-residential buildings and industry emissions, related policy coverage (EU ETS, CCA, and CRC) and proportions of direct/indirect emissions in each segment (shown by y axis). Each segment's width represents the size of its emissions. Estimates are based on CCC calculations and are approximate.
 Approximations are due to uncertainty around the level of CRC coverage, the CCA 25% exclusion CRC rule and inconsistent data sources for EU ETS and CCAs. Some commercial sectors and public sector organisations have CCAs or are captured under the EU ETS but for simplicity these have not been displayed but are small.
 All sectors are covered by CCL/RHI/ FITs/ Products policy/Carbon Trust support services/F-Gas directive/ECAs.

Section 1 – continued

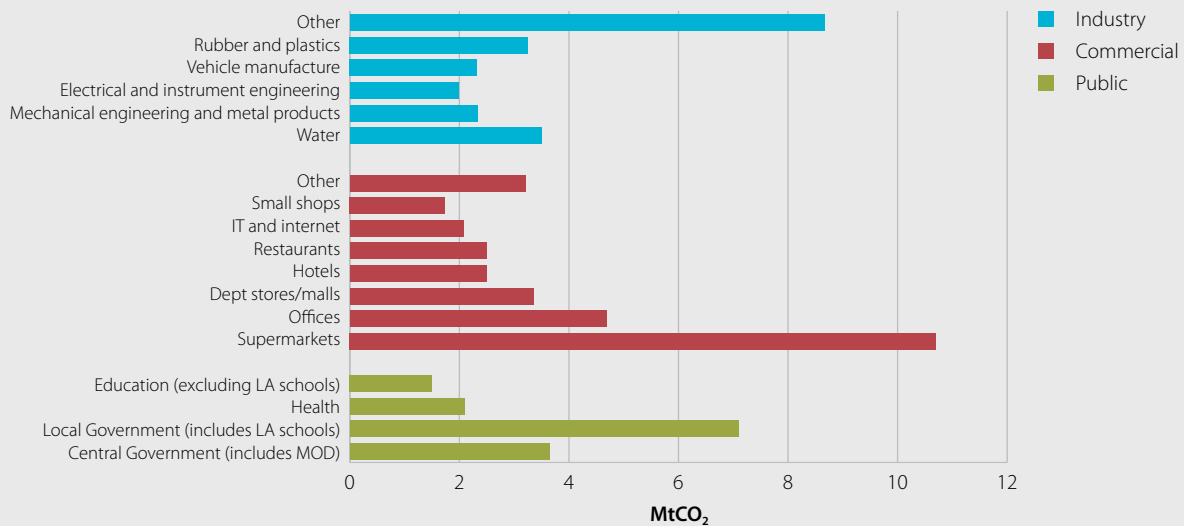
Box 3 CRC base year emissions by sub-sector (2008)

Figure B3 illustrates how CRC base year emissions are split across sub-sectors. Looking at the largest emitters in their respective sectors, commercial, public and industry:

- Supermarkets are the single largest emitter with 10.7 MtCO₂, which is equivalent to 16% of all CRC emissions. Refrigeration is the largest single source of emissions for supermarkets accounting for 40% of energy use for one leading chain.

- The inclusion of state schools in the CRC footprint of local authorities has increased coverage to the extent that local authorities now rank as the second largest emitter in the CRC with 11% of emissions.
- In contrast to the majority of sectors captured by the CRC, the water sector is energy intensive, with energy costs accounting for approximately 10% of operating costs. It is not covered by CCAs, and it accounts for 16% of industry emissions in the CRC.

Figure B3



Source: NAEI (2010); SKM Enviros (2010); DECC (2009) Digest of UK Energy Statistics; CCC calculations.
Note: All emissions estimates are CCC estimates based on analysis by SKM Enviros. For the purposes of the CRC analysis, agricultural emissions captured by the CRC are included in industry. The sector descriptions at an aggregate level are consistent with DUKES although sub-sector descriptions have been derived from secondary analysis by SKM Enviros.

The scheme is designed to provide both financial and reputational incentives:

- By placing an additional price on carbon, the scheme aims to strengthen financial incentives for the implementation of measures to improve energy efficiency.
- With the potential to receive more/less recycling payment than was spent on buying CRC allowances,

the CRC scheme aims to deliver a further financial incentive to abate, beyond the one relating to energy savings (Box 4).

- The performance of all participants is ranked each year in a league table which reflects energy intensity and emissions growth. The public nature of the table is intended to provide a strong reputational incentive to abate by raising the corporate profile of energy and carbon management (Box 5).

Figure 4: Proportion of sectoral emissions captured by the CRC (2008)

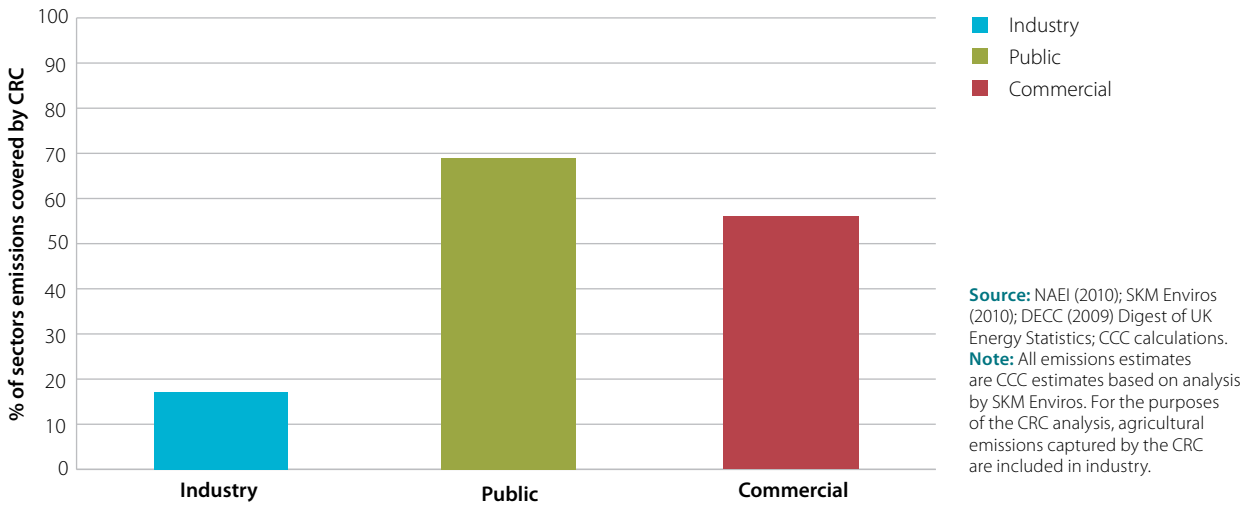
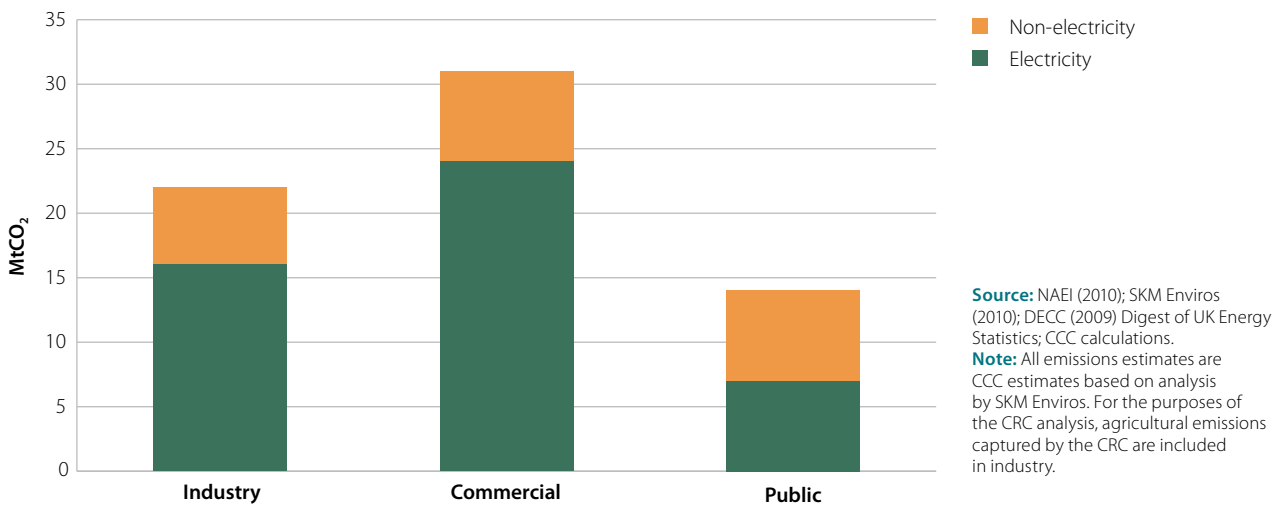


Figure 5: Composition of emissions by fuel use in the CRC sector (2008)



Section 1 – continued

Box 4 Revenue recycling payments and the performance league table

The CRC scheme is revenue neutral as all money received from the sale of CRC allowances via the Government sale each April is recycled back to CRC participants six months later. In the introductory phase of the scheme, CRC allowances will be sold at a fixed price of £12t/CO₂. The amount recycled to participants is based on two factors:

- Participants' annual base year emissions as a proportion of total CRC base year emissions in 2010/11
- Participants' position in the performance league table position. From 2013, this will be determined by two metrics: the *Absolute* metric with a 75% weighting reflects the changes in participants'

CRC emissions by comparing current year emissions to a five year rolling average; the *Growth* metric with a 25% weighting measures emissions intensity by comparing current emissions per unit of turnover (revenue expenditure for public sector) against a five year rolling average.

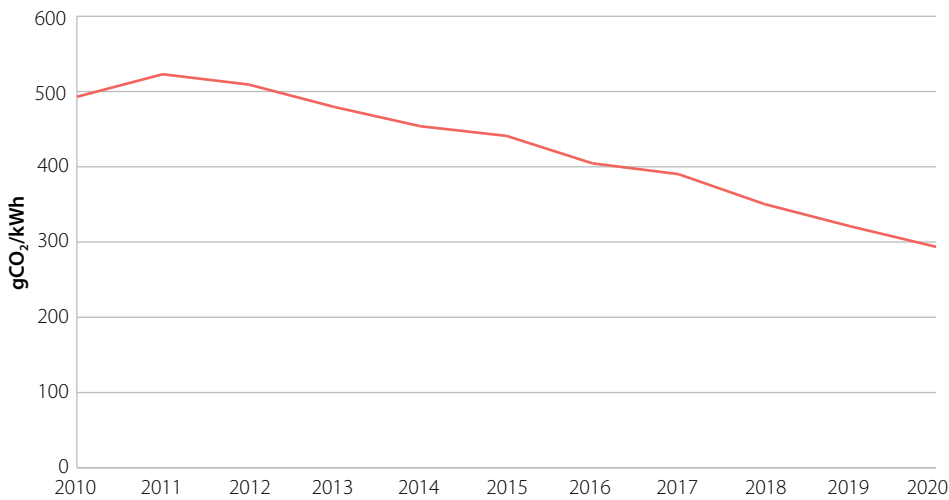
As participants' rankings in the table are determined by their relative performance against all the other participants in the scheme, they cannot predict their precise position in the league table and therefore how much recycling payment they will receive.

Box 5 Reputational impact of the CRC

This is a range of views voiced by CRC participants interviewed by the Committee on the reputational impact of the scheme:

- Reputation is also important as our store has a reputation of good Corporate Social Responsibility – first store to use 100% recycled timber. *Home improvement retailer*
- Our board will take note of the league table position. Customers will expect the company to be green. *Department Store*
- Reputation is a big driver for the supermarkets, and they will look to outperform each other. Consumers do push them to do more, and the supermarkets are continuously testing consumer behaviour. *Trade Association*
- Reputation is very important given reducing energy demand is part of the company's philosophy – corporate customers will ask what the CO₂ emissions per room are. We will want to do very well compared to rival UK hotels. *Hotel*
- Reputation is important given we are a leading local authority on environmental issues and have set ourselves ambitious targets to reduce emissions on our own estate. *Local Authority*

Figure 6: Power sector decarbonisation under CCC scenarios (2010-2020)



Source: CCC modelling (2009).
Note: This power sector scenario is taken from analysis in the CCC's first annual progress report to Parliament, published in October 2009, 'Meeting Carbon Budgets – the need for a step change'.

Second phase design

The current proposal for the second phase (2013-17) is that a cap will be set on the number of allowances for sale, with a continuation of the safety valve:

- The cap will apply from April 2013. At the beginning of each year allowances will be auctioned up to the level of the cap.
- As with the first phase, further purchases of allowances can be made from either the secondary market or the safety valve mechanism.

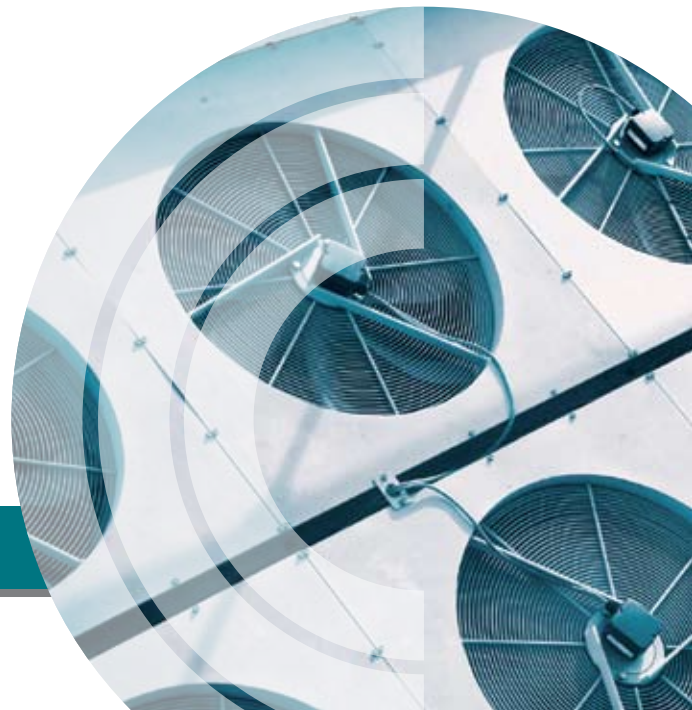
consumption multiplied by a notional grid average⁴ set at the beginning of each phase. Therefore the focus of the scheme is on demand side energy efficiency improvements over and above what is envisaged by supply side emissions reductions. Our analysis set out in Section 2 suggests an abundance of low cost measures which are complementary to supply side emissions reductions.

⁴ Taken from the Environment Agency's CRC guidance for participants. Our analysis in this report is based on this grid factor and assumes a constant carbon intensity of electricity.

Power sector decarbonisation

In parallel with the impacts of the CRC, we envisage deep cuts in power sector emissions through investment in renewable generation in the period to 2020 (e.g. in 2020, we estimate that there is scope for approaching a 40% cut in emissions from power generation relative to current levels (Figure 6)).

Recognising uncertainties over the precise pace of power sector decarbonisation, the CRC calculates electricity related emissions on the basis of electricity



Section 2

2. Analysis of emissions reduction potential and implications for setting the cap

Our approach to recommending a possible CRC cap is consistent with the methodology that we used in proposing carbon budgets⁵. We first develop a reference (or business as usual) emissions scenario, and then net realistically achievable abatement potential from this. We draw on detailed technical and economic analysis that we commissioned from SKM Enviros to inform our view on setting the cap.

Business as usual emissions

There are two steps in developing a business as usual emissions projection for the CRC:

- **Estimating base year emissions (2008):** CRC emissions are currently uncertain because it is not clear what proportion of emissions meet the 6,000 MWh threshold for inclusion in the scheme, or the level of emissions exempt under the CCA 25% rule (Box 6). We allow for this uncertainty by estimating a range for current emissions of 56-67 MtCO₂.
- **Projecting future emissions:** given estimates of current emissions, we project these forward on the basis of assumptions about GDP growth and energy prices. Specifically, we project emissions growth of 3% by 2017, consistent with emissions growth in the Department of Energy and Climate Change's (DECC) Low Carbon Transition Plan.

Box 6 Base year emissions

Our estimation of base year emissions incorporates a number of refinements on previous studies. Nevertheless, there are two sets of remaining uncertainties relating to base year emissions:

- It is not clear what proportion of total emissions reported under the scheme meet the 6,000 MWh annual electricity consumption threshold for inclusion. In addition firms below this threshold, but with annual consumption of more than 3,000 MWh in the qualification year must disclose their half hourly electricity consumption once during each phase.
- A single entity's total emissions are exempt from the CRC if more than 25% of its emissions are captured by a CCA. Where there is a group, and any member has more than 25% of its emissions in a CCA, only that member's total emissions is CRC exempt. In our analysis, we estimate this to be approximately 10 MtCO₂.

Although analysis by SKM Enviros attempts to address these issues, uncertainties remain. Therefore we have used a range for base year emissions based on different assumptions about the impacts of the threshold and the CCA 25% exemption rule. In our analysis, we estimate an emissions coverage of 67 MtCO₂.

Given these uncertainties, our focus on assessing the potential level of a cap for the second phase of the CRC is to express this as a percentage reduction relative to base year emissions, rather than as an absolute limit on emissions.

⁵ *Building a low carbon economy – the UK's contribution to tackling climate change* (2008), CCC.

Abatement potential

SKM Enviro used three modelling tools to identify abatement potential from the sectors covered by the CRC:

- The Non-Domestic Buildings Energy and Emissions Model (N-DEEM) assesses energy consumption and the potential impact of energy efficiency measures in the commercial and public sectors.
- The Industrial Energy End Use Simulation Model (ENUSIM) model, estimates energy consumption in the UK industrial sector. It takes into account the uptake of energy efficiency measures and the marginal abatement cost of these technologies subject to economic and behavioural factors that affect investment.
- The Committee’s renewable heat model (2009), developed by NERA, looks at opportunities for increasing renewable heat penetration to 2020.

The first two models suggest maximum total abatement potential of up to around 21 MtCO₂ available by 2017, almost all of which is at negative cost from energy efficiency measures (i.e. energy savings more than offset up-front costs):

- In our analysis we developed a range of scenarios to reflect different thresholds for inclusion in the scheme (3,000 MWh and 6,000 MWh), and different assumptions on key drivers of uptake of measures (e.g. fossil fuel prices, discount rates).

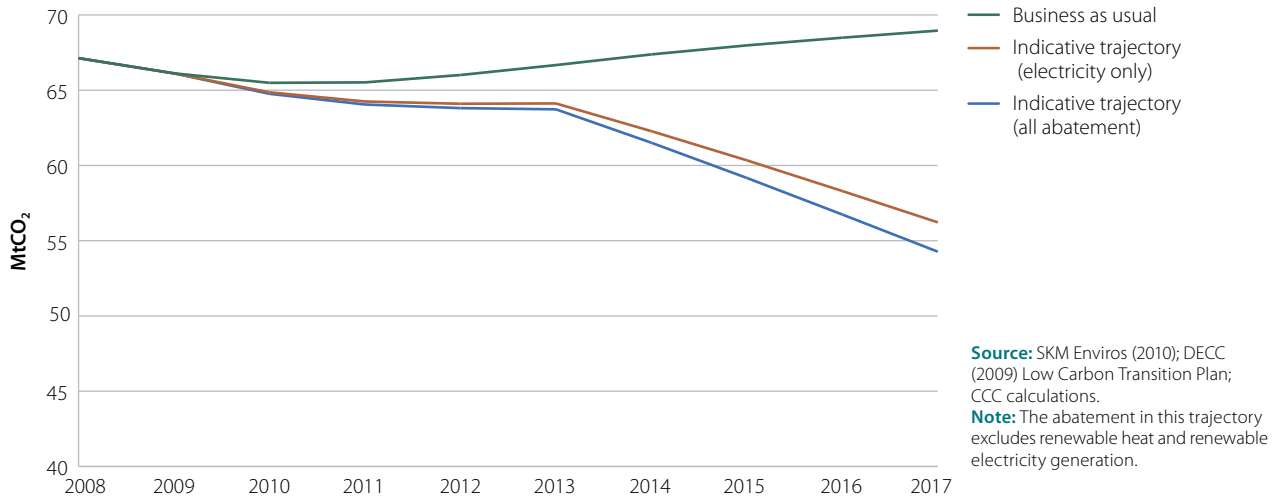
- Our ‘central’ scenario suggests emissions reductions from energy efficiency of up to 14.7 MtCO₂ by 2017, the vast majority of which is available at negative cost, based on the assumptions used in our analysis (Table 1). Around 13 MtCO₂ or 87% of abatement potential comes from electricity measures, with the remaining abatement from other fuel sources (Figure 7).
- The modelling tools used in our analysis suggest that the amount of cost effective abatement potential available is insensitive to changes in fuel prices and discount rates. This is contrary to our interviews with CRC stakeholders who indicate that abatement is sensitive to changes in fuel prices, which suggests limitations in the models.
- Abatement does vary with the penetration uptake rate of technologies, which is a variable exogenous to the ENUSIM and N-DEEM models. Moving from the ‘central’ uptake rate assumed in the central scenario to a ‘maximum’ rate increases abatement by around 40% to 20.8 MtCO₂ by 2017 (Box 7 and Figure 8).
- Additional abatement will be available through increased penetration of renewable heat (e.g. 7 MtCO₂ by 2017). However, given that we recommend that emissions should not be zero rated in the CRC, we have not included this in our analysis (see Section 4 (ii)).

Scenario description	Carbon price (£/tCO ₂)	Discount Rate (%)	Fuel prices	Technology penetration rate	GDP growth	Electricity Emission factors	CRC threshold (MWh of electricity used per year)
‘Central’	40	3.5	DECC IAG 2010 – Central	SKM Enviro 2010 – Central	DECC IAG 2010 – Central	EA CRC guidance – March 2010	6,000

Note: For detail see accompanying SKM Enviro report available on the CCC website.

Section 2 – continued

Figure 7: CRC emissions trajectory under the central scenario by the end of the first capped phase (2008-2017)

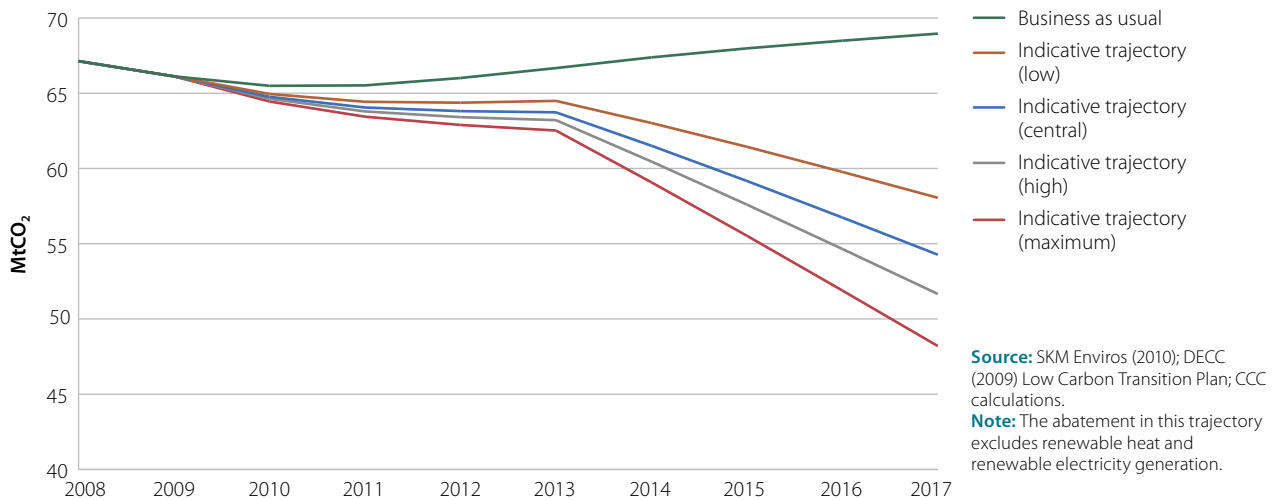


Box 7 Description of penetration scenarios

SKM Enviro developed a range of penetration scenarios for four different groups of measures (e.g. behavioural, retrofit, plant replacement for technologies with a 10 year lifespan and plant replacement for technologies with a longer lifespan of 25-30 years) for the capped phase:

- Maximum scenario: assumes that all available measures are undertaken
- High scenario: assumes a small restriction on capital spend and willingness to install, and some early retirement of plant technology
- Central scenario: assumes there are greater incentives than in the low scenario for installing measures but some restrictions to installation remain e.g. from capital availability
- Low scenario: assumes that the incentive to invest in low carbon technology is not strong enough to overcome other barriers.

Figure 8: CRC emissions trajectories under different penetration assumptions (2008-2017)



Indicative caps and implications of uncertainty

On the basis of the SKM Enviro analysis, and allowing for cost-effective abatement, the range for average annual emissions reductions by 2017 (i.e. the end of the second phase) is 1.6%-3.6% from 2008 levels, corresponding to different assumptions on penetration of technologies.

In principle, the cap could be set towards the high end of ambition in this range, resulting in a 28% reduction in emissions by 2017 on 2008 levels.

However, given the uncertainties around both CRC coverage and abatement potential in the sector, this approach would be problematic in practice because:

- There is considerable uncertainty over base year emissions coverage. In addition, informed by the SKM Enviro analysis, we have serious concerns about the limitations of the ENUSIM and N-DEEM models, and urge that the results should be treated with a high degree of caution (Box 8).
- Given these uncertainties, it is not clear that the range above reflects feasible emissions reductions

for those sectors in the CRC. Consequently, there is a risk that a cap based on this range could be either too low or too high.

- If an overly generous cap were to be set, the price of CRC allowances would crash, undermining incentives to reduce emissions. The risk of a low price would be more pronounced given that much of the abatement potential is available at low or negative cost. If the cap were to be set too tight, the price would spike in the absence of a safety valve, imposing prohibitive costs on participants.



Section 2 – continued

Box 8 Limitations of the ENUSIM and N-DEEM models

There are significant weaknesses with the ENUSIM and N-DEEM tools that have been used for CRC abatement modelling, although these models represent the best available tools for modelling commercial, public and industry sectors:

The models are not designed for CRC specific analysis (technologies and sectors):

- **ENUSIM:** The principal focus is on basic energy efficiency measures in industry and is not suitable for the type of industrial emissions covered by the CRC (principally offices and depots and not industrial processes).
 - **N-DEEM:** The model does not capture all of the different energy uses and technologies applicable to the diverse nature of the non-residential building stock covered by the CRC. Specifically, some types of buildings and technologies are not covered at all (e.g. data centres and refrigeration) and for some sectors abatement potential is estimated using a generic list of static technologies, whether they are applicable or not to that sector.
- Although uncertainty over current emissions should be resolved once actual data becomes available from participants, it is likely that considerable uncertainty will remain over the abatement potential in the absence of Government undertaking further work to model CRC specific abatement. This could take the form of either improving the existing models or developing new ones with priority given to those CRC sub-sectors that offer the most abatement contribution.

Reliability of model input data is questionable:

- **ENUSIM:** The model is based on data provided by industry on opportunities for abatement potential. The model is likely to under-represent abatement potential from fuel switching and various near market abatement technologies.
- **N-DEEM:** As the model is based on a survey of 700 buildings in the mid 1990s, the energy use, abatement measures and related emissions savings calculated by the model are unlikely to provide an accurate representation of the current situation.

Feasible take-up rates are uncertain:

- These are based on expert judgement, rather than a detailed assessment of barriers to take up and the extent to which these may be addressed through policy design. Therefore, the high uptake scenario, for example, may overestimate what is deliverable in practice through the first two phases of the CRC.

In order to address these risks, and complexities associated with the introduction of a cap, we consider options for a modified design of the CRC's second phase in the next section.

Section 3

3. Alternative options for design of the second phase of the scheme

We now consider three options for the second phase (2013-17) to address uncertainties about feasible emissions reductions and related risks:

- **Option 1:** Auction with minimum price.
- **Option 2:** Replace the auction with unlimited allowances at a fixed price.
- **Option 3:** Reform the scheme more fundamentally, including possibly reforming revenue recycling or replacing the purchase of CRC allowances with strengthened financial incentives under other instruments (e.g. reform of the CCL). Retain some aspects of the CRC (e.g. performance league tables and mandatory reporting).

Option 1: Auction with minimum price

The current proposal is that the second phase design of the CRC will include a cap, auction of allowances, and the possible purchase of allowances in the carbon market beyond the capped level. This safety valve would mitigate the risk of a price spike by setting a maximum price where the cap is set too tight relative to underlying abatement potential.

However, the risk of a price crash would remain (e.g. where the cap is set too loose relative to underlying abatement potential). In order to mitigate this risk, a minimum price would be required in the allowance auction, thereby providing a mechanism for tightening the cap in a situation where it is too generous.

The problem with moving to an auction based allocation scheme (whether it includes a minimum price or not) is that it would add an extra layer of complexity to what is already regarded by participants as a very complex scheme. It would require participants to develop bidding and purchasing strategies (e.g. whether to bid at the minimum price or above, the

number of allowances to buy in the auction and whether purchasing additional allowances at a later stage in the carbon market might be a cheaper option) or to pay intermediaries to develop strategies for them.

While we would not rule this out as an appropriate option, it would have to be demonstrated that the benefits of extra complexity outweigh the costs, including costs of administering the auction. This is unlikely to be the case, as there would be clear transaction costs but no obvious benefits in terms of strengthened incentives for energy efficiency improvement.

Option 2: Replace the auction with unlimited allowances at a fixed price

The first phase of the CRC provides both financial and reputational incentives for energy efficiency improvement. Given the complexities in moving to a capped phase, and the limited benefits in terms of additional incentives, one approach would be to retain the first phase design (i.e. selling unlimited allowances at a fixed price).

One *apparent* benefit of moving to a capped scheme is that this would provide confidence over the level of emissions in the context of carbon budget management and meeting UK obligations to the EU.



Section 3 – continued

A similar degree of confidence could be provided under the first phase design, with the Government setting an emissions target for the CRC based on an assessment of underlying potential, and using some funds from the scheme's recycling pot to purchase allowances in the carbon market to cover any shortfall in the delivery of abatement.

However, it is not clear that purchasing allowances in the carbon market – either under a cap or an emissions target – is helpful from the perspective of carbon budget management and meeting EU targets (Box 9).

An alternative would be to use the funds from the purchase of allowances from the Government sale to address barriers to implementation of measures (e.g. by providing tax incentives or creating an energy efficiency loan fund), therefore ensuring reductions in domestic emissions rather than requiring the purchase of allowances to meet carbon budgets.

Box 9 Meeting carbon budgets by the purchase of allowances via the safety valve

Purchasing allowances via the safety valve to deliver a target level of emissions from the CRC would have limited benefit in terms of carbon budget management:

- Failing to deliver emissions reductions in the CRC would have only a limited impact in terms of meeting wider carbon budgets, given that most of the emissions and abatement potential in the CRC are in the traded sector (i.e. electricity related), where by definition carbon budgets will be achieved.
- For direct emissions (i.e. non-electricity related emissions), failure to deliver abatement potential could take the non-traded sector budget off track. However, given the small share of direct emissions and related abatement potential in the CRC sectors, it is unlikely that this effect would be significant in practice.

Option 3: More fundamental reform of the scheme

Amongst the options for more fundamental reform are:

- **Reforming revenue recycling:** Financial benefits associated with emissions reductions under the CRC are uncertain to participants, particularly given the complexities of the methodology for recycling revenues:
 - It is not clear that the current revenue recycling arrangements reward energy efficient firms. There is a risk that firms which are already energy efficient are penalised under the scheme. Further evidence is required to establish that incentives under the scheme are appropriate in terms of rewarding the most energy efficient participants.
 - One option would be to drop revenue recycling, which would raise the cost of the scheme to participants, therefore possibly raising its corporate profile. It is not clear how this would impact on incentives for energy efficiency improvement. On balance, impacts from dropping revenue recycling could work in different directions, with the net impact uncertain based on available evidence.
 - Dropping revenue recycling could be attractive from a fiscal perspective, although the economic rationale would depend on the design of other carbon price instruments (e.g. together with the EU ETS and the CCL, this would become a triple carbon tax).

- **Dropping the sale of allowances:** The CRC provides two types of financial incentives; strengthening the carbon price signal and raising the corporate profile of energy efficiency improvement (e.g. because finance directors must sign off the purchase of allowances). If other instruments (in particular the CCL) were to be reformed to provide a robust carbon price signal for emissions from both electricity and other fuel sources, this would raise a question over the need for additional financial incentives for energy efficiency improvement in the CRC. One possibility is that the CRC could be redesigned as a scheme which provides only reputational incentives through mandatory reporting and league tables. In order to assess this option, further evidence is required on financial incentives provided by the scheme, and the corporate profile that these give to the issue of energy efficiency.

Overview of options for second phase design

We recommend that the second phase is based on an unlimited availability of allowances at a fixed price as set out in option two. This recommendation reflects the uncertainties over the level of feasible emissions reductions in the sectors covered by the CRC, and the complexities/transaction costs for a capped scheme.

This option would maintain the financial and reputational incentives relevant to the current proposal for the second phase. Whether more fundamental reform would be appropriate goes beyond the scope of this report, but could be considered in parallel with the initiative to reform the CCL announced in the June 2010 Budget, and in light of further evidence on how the various financial and reputational incentives under the scheme actually work in practice.



Section 4

4. Other design aspects

We have considered a number of design aspects of the CRC which could potentially be changed for the second phase of the scheme:

- (i) Separate league tables for the public and private sectors
- (ii) Incentives for investment in renewable energy
- (iii) Threshold for inclusion in the CRC
- (iv) Addressing barriers to uptake of energy efficiency improvement

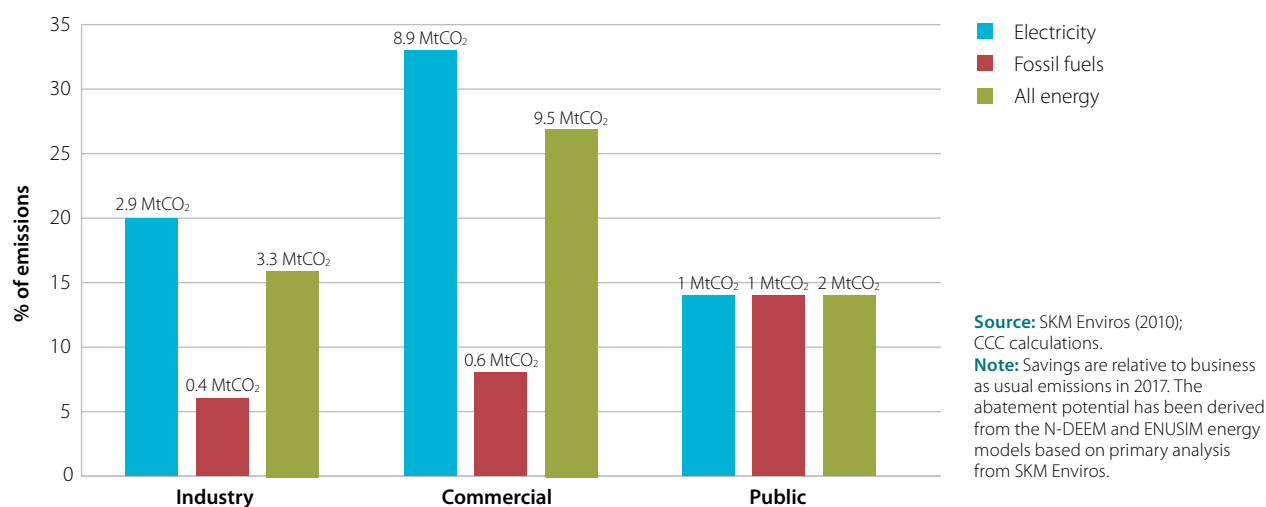
(i) Separate league tables for the public and private sectors

The ranking of performance in a published league table offers a strong reputational driver to participants. As currently proposed, all participants will be ranked in one league table, on the basis that this will avoid the fragmentation and complexity of sector specific tables.

However, there are clear differences between public and private sector organisations, particularly in the context of budget cuts:

- Increasingly budget constrained public sector organisations may lack the finance for required investments in energy efficiency improvement, even where pay back periods are relatively short.
- The impact of public sector budget cuts on emissions intensity relative to total revenue expenditure is unclear. For example, heating and hot water levels in schools and other public sector buildings will need to be maintained notwithstanding budget cuts. This will have the impact of increasing emissions intensity under the CRC growth metric.
- Public sector abatement potential is limited, representing only 14% of public sector emissions in 2017 under the central scenario. This compares to the commercial sector’s abatement potential of 27% of its emissions (Figure 9).

Figure 9: Proportion of each sector’s emissions abated under the CCC’s central scenario in 2017



If public sector organisations are limited in their ability to improve energy efficiency, while facing increasing emissions intensity due to budget cuts, they risk being placed at the bottom of the league table. This would result in the transfer of funds from public to private sectors through the revenue recycling mechanism.

This risk would be mitigated by having separate league tables for public and private sector organisations, which would allow public sector organisations to be ranked with respect to each other, and ensure the recycling of CRC revenues remains within the public sector. We therefore recommend having separate league tables for public and private sectors.

(ii) Incentives for investment in renewable energy

There are currently a number of policies in place or under development to support investment in renewable energy (e.g. the Renewables Obligation, Feed in Tariffs, the Renewable Heat Incentive).

This is recognised in part in the design of the CRC. Emissions from renewable electricity generated and consumed on-site will be reported at the grid average where ROCs or FITs are claimed. This treatment does not provide additional financial incentives for investment in renewable electricity generation.

A different approach is adopted for renewable heat, where investment in renewable heat results in zero emissions as accounted for under the scheme. Therefore the scheme provides additional financial incentives (e.g. over and above those proposed in the RHI consultation) for investment in renewable heat.

However, assuming that the RHI is designed to provide adequate support for renewable heat, it is not clear why additional support, which would be overly generous for investors in renewable heat, should be provided through the CRC. The wider question of whether

the RHI and other renewable energy instruments are providing sufficient incentives will be covered by our review on renewable energy, which we will publish next year.

Zero rating of renewable heat emissions would also reduce incentives to invest in measures to improve the energy efficiency of heating systems or the building fabric.

Therefore we recommend that the approach to renewable heat under the CRC should mirror the current approach to renewable electricity: it should be recognised alongside the league tables so as to provide additional reputation incentives, but should be subject to the purchase of CRC allowances in the same way as any other form of heat.

(iii) Threshold for inclusion in the CRC

The Government originally considered a lower qualification threshold of 3,000 MWh annual electricity consumption to capture smaller organisations, before settling on the current threshold of 6,000 MWh during the consultation process. The rationale for the higher threshold was that it would “help further ensure that the organisations covered are larger energy users with the greatest potential to make significant energy savings”⁶.

Analysis by the Carbon Trust (Box 10) suggests that there is a relatively abundant latent potential in smaller rather than larger organisations. However, we have noted the significant uncertainties in the analysis undertaken by SKM Enviros, and therefore the possibility that there could be additional potential from lowering the threshold.

Further consideration should be given to lowering the threshold for inclusion. As part of this, further evidence is required on emissions reduction potential, transaction costs, and alternative options for incentivising energy efficiency improvement in SMEs currently being considered by DECC (e.g. the Green Deal).

⁶ *Final Impact Assessment on the Order to Implement the CRC Energy Efficiency Scheme (2009)*, DECC.

Section 4 – continued

Box 10 Identified CO₂ savings from different sized organisations (2006/07)

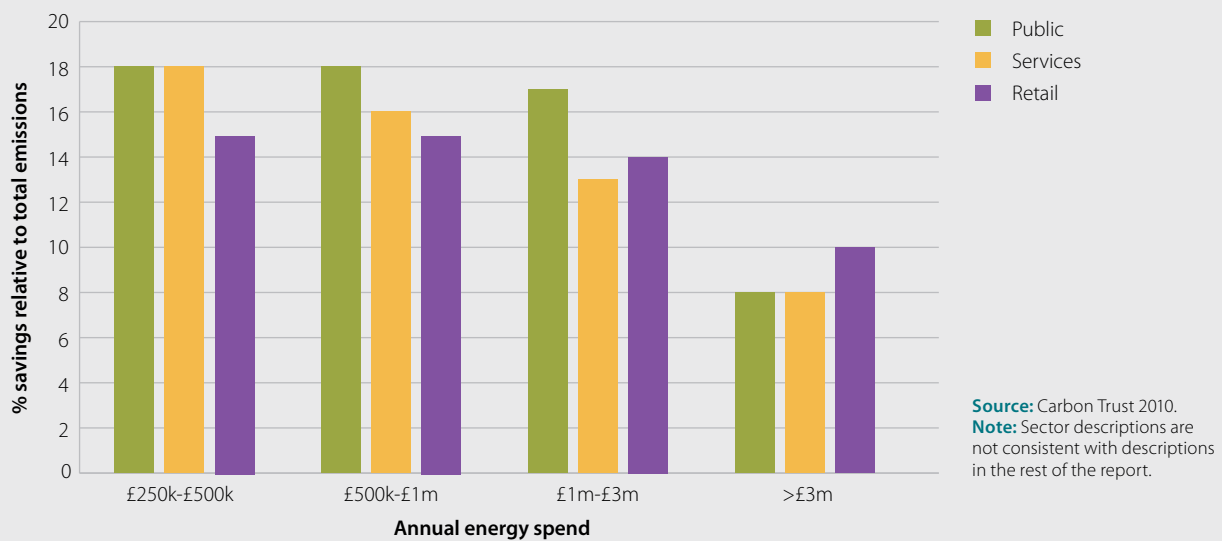
Analysis undertaken by the Carbon Trust based on data from its site surveys suggest that smaller organisations can offer higher percentage emissions savings from carbon management compared to larger organisations, given that smaller organisations tend to have made less progress on energy efficiency improvement.

As Figure 10 shows, the smaller organisations offer higher savings compared to the largest organisations. The reasons include the absence of policy levers targeting this group; the lack of staff resources/finance

resulting in opportunities to abate not being identified (and even if they are there is little take-up); and that they are more likely to occupy tenanted properties.

However, it should be noted that the way the Carbon Trust collects the data could bias the numbers towards identifying greater savings opportunity in SMEs (e.g. audits for larger organisations tend to be focused on one area of emissions/energy use, thus ignoring savings that could be achieved elsewhere, whereas an audit for an SME tends to look across the whole organisation).

Figure B10



(iv) Addressing barriers to uptake of energy efficiency measures

As noted in section one, the rationale for the introduction of the CRC was that the existing package of policies was not providing the necessary incentives to abate in a sector where energy costs make up a relatively small proportion of total costs, and where organisational barriers exist.

As currently designed, the scheme will strengthen financial and reputational incentives and therefore address some of the barriers that have prevented organisations from taking up cost effective action in the past (e.g. inertia, poor energy data and lack of senior management interest in carbon management).

However, the scheme does not address all of the financial and non-financial barriers that currently inhibit the implementation of measures (e.g. finance constraints, lack of staff with an understanding of the scheme, other organisational priorities).

Complementary levers and approaches will be required to ensure that the full abatement potential is unlocked (e.g. the provision of tailored information and guidance, availability of funding and appropriate design of loan instruments, and availability of funds for investment in the public sector notwithstanding current cuts).



Section 5

5. Next steps

There are a number of key decisions for the Government to make in finalising the second phase design for the CRC:

- To drop the cap for the second phase based on complexities/transaction costs that an auction would imply and limited offsetting benefits.
- Whether to include provision for allowance purchase or use of funds to address barriers to implementation of measures in the context of carbon budget management.
- Whether to go further and strengthen financial incentives through reforming revenue recycling, or alternatively to address financial incentives through other instruments, with further evidence required on how financial incentives under the CRC actually work in practice.
- To adopt separate approaches to public and private sector.
- To adopt equivalent approaches to renewable electricity and heat.
- Whether to lower the threshold for inclusion in the CRC.
- To consider complementary approaches to address the full range of financial and non-financial barriers.

- How to improve the evidence base on abatement potential in the CRC – through strengthening existing models or developing new models – in order to support scheme design, and monitoring of its effectiveness.

The Committee will continue to work with DECC on a number of these issues including improving the evidence base on abatement potential, options to encourage SME energy efficiency improvement, the broader approach to renewable energy, and reform of current carbon price instruments. We will report back on progress towards implementing the CRC in our 2011 progress report to Parliament and in subsequent progress reports.

Glossary

Allowance

An allowance is purchased from the Government and represents the right to emit one tonne of CO₂ by a CRC participant. These can be bought and sold on the secondary market.

CRC Energy Efficiency Scheme (CRC)

In operation since April 2010, the CRC is a mandatory carbon reduction and energy efficiency scheme for large non-energy intensive public and private sector organisations, in addition to energy intensive companies as regards that part of their emissions not covered by EU ETS and Climate Change Agreements (CCA).

Carbon dioxide equivalent (CO₂e)

The amount of carbon dioxide that would give rise to the same level of radiative forcing, integrated over a given time period, as a given amount of well mixed greenhouse gas emissions.

Climate Change Agreement (CCA)

Gives energy intensive businesses a rebate on the Climate Change Levy subject to the achievement of agreed energy efficiency/emissions targets.

The Climate Change Levy (CCL)

The charge applies to all non-residential energy users. It covers both electricity and non-electricity related consumption.

European Union Allowance (EUA)

Units corresponding to one tonne of CO₂, which can be traded in the EU ETS.

European Union Emissions Trading Scheme (EU ETS)

A cap and trade system on the power sector and energy intensive industry in the EU.

Feed In Tariff (FIT)

A long term guaranteed price is paid to renewable electricity generators for output delivered to the grid. The scheme started in April 2010.

Greenhouse Gas (GHG)

Any atmospheric gas (either natural or anthropogenic in origin) which absorbs thermal radiation emitted by the Earth's surface. This traps heat in the atmosphere and keeps the surface at a warmer temperature than would otherwise be possible; hence it is commonly called the Greenhouse Effect.

MtCO₂

Million tonnes of carbon dioxide (CO₂).

MWh (Megawatt hour)

A measure of energy equal to 1,000 kWh.

Non-traded sector

Those parts of the economy not covered by the EU ETS.

Renewable Heat Incentive (RHI)

A long term guaranteed price paid for each unit of renewable heat produced by householders and businesses. The scheme is proposed to start in April 2011.

Renewable Obligation Certificate (ROC)

Certificate issued to an accredited electricity generator for each MWh of eligible renewable electricity generated.

Traded sector

Those parts of the economy covered by the EU ETS.



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