

# Implementing the Climate Change Act 2008:

The Government's proposal for setting the fourth carbon budget

Policy Statement

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## Ministerial Foreword



The UK is at the forefront of developing a low carbon economy, providing green growth and economic development. This has been stimulated by the Climate Change Act (2008) which established the world's first legally-binding national framework to reduce the UK's greenhouse gas emissions by at least 80 per cent by 2050.

The Act also introduced five year "carbon budgets" to 2050 and a target to reduce emissions by at least 34 per cent by 2020. The measures we are currently taking to meet our first three carbon budgets are already stimulating investment in low-carbon technologies and building the infrastructure to support our future green economy.

Government initiatives such as the Electricity Market Reform will ensure secure, clean and affordable power and will guard against the volatility of world fossil fuel markets. The Renewable Heat Incentive will spur additional private investment in the non-domestic sector in low carbon heat by 2020. The UK's share of the EU 2020 renewables target will result in a five-fold increase in renewables in this decade alone and this, coupled with early investment in Carbon Capture and Storage (CCS), will support green jobs and offer export opportunities.

The fourth carbon budget represents a challenging level of ambition but also an opportunity for growth in our economy through increased investment in green technologies and services. It demonstrates that the UK will continue to lead the way on climate change at a domestic level and is willing to go further in the context of a successful global deal.

A handwritten signature in black ink, consisting of a large, stylized loop followed by a horizontal line that ends in a small flourish.

## Executive summary

This document provides the Government's policy statement on the proposed level of the fourth Carbon Budget (2023-2027) and was presented to Parliament on 24 May 2011. The Government is seeking Parliament's agreement to accepting the Committee on Climate Change's recommendation on setting the level of the fourth carbon budget at 1950 million tonnes of carbon dioxide equivalent (MtCO<sub>2</sub>e).

The proposed level of the fourth carbon budget is consistent with what the UK needs to do to play its part in international efforts to limit the expected increase in global temperature above pre-industrial levels to two degrees Celsius, consistent with scientific advice on avoiding the dangerous effects of climate change. Our analysis confirms that the proposed level of the fourth carbon budget is also consistent with the trajectory set out by the European Commission in its March 2011 Roadmap.

The Government will make every possible effort to meet the fourth carbon budget through domestic action, as far as is practical and affordable, but we also intend to keep the option of trading to retain maximum flexibility. This is a pragmatic approach when considering the uncertainty involved in looking so far ahead. We have also stated our intention to review the budget in 2014 to ensure consistency with the EU Emissions Trading System (ETS). If, at that time, our domestic commitments place us on a different emissions trajectory than the EU ETS trajectory agreed by the EU, we will, as appropriate, revise up our budget to align it with the actual EU trajectory.

Setting an ambitious fourth carbon budget will help drive low carbon technologies and increase our resilience to dramatic changes in the price of oil, resulting in a more stable economy. Our analysis, as well as that of the European Commission and of the Committee on Climate Change (CCC) shows that taking ambitious early action is the most cost-effective way of tackling greenhouse gas emissions.

# Introduction

## The proposed level of the fourth Carbon Budget

1. The Government is seeking Parliament's agreement to accept the Committee on Climate Change's recommendation on the level of the fourth carbon budget of 1950 million tonnes of carbon dioxide equivalent (MtCO<sub>2</sub>e). The Government will make every possible effort to meet this by domestic action, as far as practical and affordable, but we also intend to keep the option of trading open to retain maximum flexibility. This is a pragmatic approach when considering the uncertainty involved in looking so far ahead.

## Why taking action on climate change is important

2. Climate change is the greatest environmental challenge facing the world today. Its effects will be felt globally, as temperature increases will affect people's livelihoods and lifestyle, and cause a radical change in the earth's biodiversity and climate systems.
3. The Government's goal is to stabilise atmospheric greenhouse gas concentrations to avoid the dangerous effects of climate change, and to adapt to those effects that have become irreversible. The UK has a vital role to play as a leader in the global initiative to tackle climate change and is working through the European Union and the United Nations Framework Convention on Climate Change (UNFCCC) to reach a global agreement on action to mitigate climate change. Without urgent and coordinated action across the world, the risks of climate change will become a dangerous reality for the whole planet.

## The Climate Change Act 2008 and carbon budgets

4. The UK accounts for less than two per cent of global emissions. If we are to address the challenge that climate change presents to our security and prosperity, we must do so by acting in partnership with other countries. To make our position credible on the global stage, we have to show that we are making real progress in cutting our own emissions, meeting our own targets, and enabling our own economy to move to a low carbon future. And we have to show we are doing so without jeopardising economic success, energy security and business competitiveness. For this reason the UK has established the world's first long-term legally binding national framework to tackle the cause and mitigate the effect of climate change through the Climate Change Act 2008 ('the Act'). The Act created a new approach for Government to manage and respond to climate change in the UK. It sets ambitious targets and establishes clear and regular accountability to Parliament for progress towards the targets.

5. At the heart of the Act is a legally binding target to reduce the UK's greenhouse gas emissions to at least 80 per cent lower than the 1990 baseline by 2050, to be achieved through action at home and abroad. To drive progress towards this target, the Act introduced five year 'carbon budgets', which define the emissions pathway to achieve the 2050 target, starting in 2008. Carbon budgets drive the transition to a low carbon economy by ensuring the Government puts in place policy measures to achieve emissions reductions consistent with the pathway set by carbon budgets.
6. A carbon budget is the total quantity of greenhouse gas emissions permitted in the UK over a five year time period. Under the Act, three five-year carbon budgets representing 15 years ahead must always be in place. The first three carbon budgets were set in law in 2009 and mean we will reduce emissions to at least 34 per cent lower than the 1990 baseline by 2020.
7. Under the system of carbon budgets, every tonne of greenhouse gas emitted between now and 2050 will count. Where emissions rise in one sector, we will have to achieve a corresponding fall in another sector, or purchase international offset credits. If a carbon budget is missed, the Government would be in breach of the Act and will be required to submit a report to Parliament setting out proposals to compensate for the excess emissions in future periods. Carbon budgets therefore enable better future planning of emissions reductions.
8. The fourth carbon budget must be set in legislation no later than 30 June 2011, with a view to meeting the 2050 target and to comply with the UK's European and international obligations.

#### The Committee on Climate Change

9. The Act established an independent expert body, the Committee on Climate Change (CCC), to advise the Government on setting carbon budgets and to report to Parliament on the progress made in reducing greenhouse gas emissions. The CCC publishes a progress report every year in June, and a special report when the Government is preparing to set a new carbon budget. The CCC published its report advising Government on the level of the fourth carbon budget in December 2010.
10. This document provides an initial high-level response to the CCC advice. The Act requires that Government publishes a report setting out proposals and policies for meeting the fourth carbon budget 'as soon as is reasonably practicable' after setting the new carbon budget in legislation. DECC's Business Plan specifies that Government intends to publish that report in October 2011.
11. This document summarises and explains the Government's proposals on the level of the fourth carbon budget recommended by the CCC. The proposals set out in this document are subject to agreement by Parliament.
12. This document also fulfils the obligations in the Act to make public those matters the Government must consider in recommending a particular budget level according to section 10 of the Act; and to publish a statement setting out whether and how the views of the Devolved Administrations in Northern Ireland, Scotland and Wales have been taken into account. While this particular document is a UK Government publication, the Act is based on a partnership between the UK Government and Devolved Administrations.

## The carbon budget accounting rules

According to carbon accounting rules<sup>1</sup>, carbon savings are attributed either to the Traded Sector or to the Non-Traded Sector of the economy:

- The Traded Sector (TS) comprises emissions from the electricity generation and heavy industry activities that are included in the European Union's Emission Trading System (EU ETS). Emissions in the EU ETS are constrained by an overall limit (generally referred to as 'the cap') which drives emissions reductions. Each European Member State has a share of the overall cap, based on allowances either allocated for free or auctioned to EU ETS participants. It is the UK's share of the cap that is used to measure whether emissions in the TS comply with carbon budgets. If further emissions reductions occur below the UK's share of the cap, this will not count towards carbon budgets but could help the UK meet its share of the EU ETS cap more cost-effectively.
- The Non-Traded Sector (NTS) comprises emissions from all other sectors of the UK economy (mainly emissions from heating households and businesses, and emissions from transport, agriculture and waste) that are not subject to the EU ETS. Any carbon savings taking place in the NTS are driven by a variety of policy measures and contribute to achieving carbon budgets. Savings in the NTS are therefore extremely significant for carbon budgets.

## The fourth carbon budget

The CCC's recommendations on the fourth carbon budget

13. The CCC recommended that the Government sets in legislation a fourth carbon budget of 1950 MtCO<sub>2</sub>e for the period 2023 to 2027. This equates to a 50 per cent reduction in greenhouse gases on 1990 levels for each year over the fourth carbon budget period. The CCC advised that this level should be met through domestic emissions reductions without relying on the use of international carbon credits, to offset UK emissions, including through the use of the EU ETS.

The Government's proposal for the fourth carbon budget level

14. When Government set the first three carbon budgets, it had clear guidance provided by an established European and international framework, and evidence of possible technological developments in the short term future. The fourth carbon budget is significantly further ahead in the future so there is greater uncertainty about technical feasibility and risks. However, the decision to set an ambitious fourth carbon budget now, on the basis of the best available evidence, is a critical one for the UK climate and energy policy framework and will help drive the innovation, technological development and entrepreneurship in the UK that we need to deliver a dynamic, low carbon economy that is internationally competitive.
15. Setting an ambitious fourth carbon budget will help drive low carbon technologies and increase our resilience to dramatic changes in the price of oil, resulting in a more stable economy. Our analysis, the European Commission's and that of the CCC show that taking ambitious early action is more cost-effective than delaying it and leaving emissions reductions to later.

<sup>1</sup> [http://www.decc.gov.uk/assets/decc/consultations/carbon%20accounting/1\\_20091211101501\\_e\\_@@\\_guidancecarbonaccounting.pdf](http://www.decc.gov.uk/assets/decc/consultations/carbon%20accounting/1_20091211101501_e_@@_guidancecarbonaccounting.pdf)

16. The proposed level of the fourth carbon budget is consistent with what the UK needs to do to play its part in international efforts to tackle climate change. Our analysis confirms that the proposed level of the fourth carbon budget is also consistent with the proposed trajectory set out by the European Commission in its March 2011 Roadmap.
17. The CCC recommended emissions in the non-traded sector should be 1260 MtCO<sub>2</sub>e and emissions in the traded sector should be 690 MtCO<sub>2</sub>e over the period of the fourth carbon budget. The Government's assessment confirms that the CCC's recommended level of emissions in the non-traded sector is very ambitious but technically feasible. We will be carrying out further work leading up to October to assess in more detail how to best deliver this abatement. For the traded sector, Government relies on taking action within the European framework. A more stringent EU ETS cap could deliver the level of emissions reductions required and we will therefore continue to push strongly for a greater level of ambition in the EU ETS, including as part of a potential EU move to a 30 per cent emissions reduction target by 2020. If the EU ETS is not tightened sufficiently in the future, we would automatically see fewer emissions reductions in these sectors. The Government has therefore agreed that the level of 1950 MtCO<sub>2</sub>e is conditional on EU progress towards the EU emission goal and we will review this by 2014. If, at that time, our domestic commitments place us on a different emissions trajectory than the Emissions Trading System trajectory agreed by the EU, we will, as appropriate, revise up our budget to align it with the actual EU trajectory.
18. The level of greenhouse gas emissions in the future will depend on many factors over which the UK does not have full control, and further developments may happen in future European policy and international negotiations. The Act allows the Government to amend carbon budgets if it appears that significant changes have occurred since the carbon budget was originally set. These changes should be of a nature that affects the basis on which the previous decision was made, such as changes to international or European legislation or policy, or new evidence on climate change science.
19. The Government's proposal on the level of the fourth carbon budget is based on wide ranging economic analysis. In considering this body of evidence the Government placed emphasis on the efficiency principle, to ensure we propose a budget level that minimises costs to society. The analysis provides the Government with three perspectives:
- **A global perspective** – considering what the efficient level of UK territorial emissions would be as part of a global effort to reduce emissions, consistent with meeting the objective of limiting the expected increase in global temperature above pre-industrial levels to two degrees Celsius.
  - **A long-term UK pathway perspective** – considering what a least-cost pathway to 2050 would be given considerations of the energy system and mix of technologies, balancing costs of action now with long-term costs to 2050 and ensuring the UK is on track over the 2020s to meet the 2050 target; and
  - **A 'static' perspective** – considering how much the UK can feasibly and cost-effectively reduce emissions by over the 2020s.
20. This body of evidence is summarised in this policy statement. The analysis is described in more detail in the Impact Assessment published alongside this document.

## The global perspective

21. The global emissions analysis assesses a global reduction in emissions which is consistent with the objective of limiting the expected increase in global temperatures above pre-industrial levels to two degrees Celsius and with the offers made in the Copenhagen Accord<sup>2</sup>. This analysis suggests that a central estimate for the cost-effective level of emissions in the UK territory alone in the fourth carbon budget period would be in the region of 1950 MtCO<sub>2</sub>e, provided that the rest of the world is also taking action. Such a level is broadly consistent with a cost-effective UK contribution to concerted global action consistent with a two degree trajectory on climate change in the 2020s<sup>3</sup>. Our analysis is therefore consistent with the CCC advice.
22. Reducing emissions in the UK alone may not be cost-effective unless accompanied by commensurate action internationally. We need to show leadership in this area and will therefore continue to push strongly for ambitious and effective action from other countries.

## The UK long-term pathways perspective

23. The Act requires that carbon budgets are set with a view to the UK's 2050 emission reduction target. It is important to consider the appropriate pathway that minimises costs over time of reaching this target. Consideration needs to be given to views on technical feasibility, key technologies for the pathway to 2050 and implications for investment and action over the 2020s given risks of lock in, supply chains, innovation, and consumer preferences and behaviour change.
24. The CCC's recommended budget level of 1950 MtCO<sub>2</sub>e is the minimum level of effort they consider to be consistent with the 2050 target following their assessment of prudent development and deployment of technologies needed to reduce emissions by at least 80% in 2050; a looser budget would imply less effort was required in these areas which, they concluded, would in turn increase risks to and raise costs of meeting the 2050 target.
25. Government modelling work drawing on cost optimisation models can assess a range of least-cost pathways to achieve a given emission reduction target or trajectory whereas the DECC 2050 Calculator allows exploration of the full range of technical possibilities available to meet the 80 per cent target, but does not currently take into account costs.
26. Results indicate that pathways with early action (pathways which require greater reductions in emissions in earlier years) are more cost-effective over time than pathways which delay action towards meeting the 2050 emissions reduction target, which would leave greater emissions reductions to later years. Delaying action could lead to higher costs over the period to 2050 due to lock-in to carbon-intensive technologies, increased pressure on supply chains in later years and an increased risk of not meeting the 2050 target. This result does not in itself imply a particular budget level, but does conclude that Government's proposed level of the fourth budget would be consistent with a feasible and efficient pathway to 2050.
27. Further, the models also show that all sectors need to contribute to emissions reductions and that any successful pathway to 2050 is likely to require significant additional effort, beyond what existing policy is currently delivering.

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<sup>2</sup> In the Copenhagen Accord countries committed to the goal of limiting global temperature increase to within two degrees Celsius and developed countries agreed to mobilise \$100bn of climate finance annually by 2020 to help developing countries meet the climate challenge. The text of the Copenhagen Accord is available at <http://unfccc.int/resource/docs/2009/cop15/eng/l1a01.pdf>

<sup>3</sup> Analysis using DECC's Global Carbon Finance model (GLOCAF) and the EU PRIMES model.

## The UK 'static' perspective

28. The Government's analysis includes an assessment of emissions reductions that could be achieved across the UK economy in the 2020s, over the anticipated achievement of current policies, by assessing abatement potential using a technology-by-technology approach. This bottom-up analysis focused on the non-traded sector and indicates that meeting a fourth carbon budget non-traded sector level of 1260 MtCO<sub>2</sub>e is achievable. There may be barriers to overcome that Government action should consider addressing, and action may involve pursuing measures that are not considered to be cost effective according to our projected price of carbon over the fourth budget period. There is however a strong rationale for incentivising emissions reductions through key but more expensive technologies over the fourth budget period if these help the UK to achieve the 2050 target more cost-effectively. This will be considered more fully in the October report on policies and proposals to meet the fourth carbon budget.
29. The Government is already working on the design and delivery of an ambitious new set of policies that put us on the right track to deliver the reductions required. The Green Deal will boost action by households and businesses in energy efficiency measures. This, together with the roll out of smart meters, and other energy efficiency policies to support industry and businesses, will create the conditions for the domestic and non-domestic sectors of the UK economy to deliver challenging but achievable emissions reductions. Other sectors will need to deliver ambitious reductions too, and Government has already started to unlock this potential by launching the world's first Renewable Heat Incentive and by providing support for the deployment of electric vehicles and the necessary related infrastructure. The late 2020s seem quite a way in the future, but we need to consider now the full range of technologies that must be developed to achieve a transition to a low carbon economy. The October report on the fourth carbon budget will provide more details on our policies and proposals to deliver further emissions reductions in the 2020s.
30. The UK electricity sector faces different but equally ambitious challenges to transition to lower carbon forms of generation, whilst ensuring secure and reliable supply of electricity to the country. The Electricity Market Reform and the introduction of a carbon price support will trigger the necessary level of investment in new forms of low carbon generation and will ensure secure, clean and affordable power for our recovery, enhancing the UK resilience to the volatility of world fossil fuel markets. The UK is also committed to continue efforts within the context of the European framework, and to working with the European Commission and other Member States to ensure the European Emissions Trading System will continue to drive emission reductions in this sector of the economy.
31. As part of the transition to a low carbon economy, we need to ensure that energy intensive industries remain competitive and that we send a clear message that the UK is open for business. Before the end of the year we will be announcing a package of measures for energy intensive businesses whose international competitiveness is most affected by our energy and climate change policies.

## The EU and International Context

### The international context

32. The CCC concluded in its report on the fourth carbon budget that the fundamental science on the existence of climate change and its effects remains robust, and continues to grow and strengthen year-on-year<sup>4</sup>. While uncertainties remain in the detail of how the Earth's complex climate system will respond to temperature increases, the case for taking action to tackle climate change remains compelling. Global climate change is already happening and it is very likely that this is largely a result of human activity. Without action, there is a high probability that temperatures will rise well beyond two degrees Celsius, which is the level that world scientists suggest will reduce (but not avoid) the most serious risks from climate change.
33. The UK is amongst the 195 countries that form part of the UNFCCC. The UK is an active member in international negotiations and strongly supports the international process to work towards an ambitious global climate deal that will limit emissions and explore the creation of new international sources of funding, for the purpose of climate change adaptation and mitigation.
34. The Conference of the Parties (COP) that took place in Cancun in December 2010, put the UNFCCC process back on track and demonstrated that it remains the most likely vehicle for delivering a comprehensive legally binding agreement to tackle climate change. However, further work is needed to put the world on a cost effective pathway to achieving the two degrees Celsius objective. Parties need to deliver on the agreements made in Cancun but also raise ambition further in the coming year. The UK will work to ensure that we continue to develop the momentum and trust that Cancun generated and ensure further progress is made on issues of substance in the next COP meeting in Durban at the end of 2011.

### The European Union commitment and European Commission Roadmap

35. The European Union (EU) committed in 2007 to reduce its overall greenhouse gas emissions by at least 20 per cent below 1990 levels by 2020, and to increase this to 30 per cent if the international conditions are right. It has also set targets to increase the share of renewables in energy use to 20 per cent by 2020, and to save 20 per cent of energy consumption by 2020 through increased energy efficiency.
36. On 8 March 2011 the European Commission published a Roadmap for transforming the EU into a competitive low carbon economy by 2050. The document sets out the cost-efficient trajectory for reducing emissions by 2050, consistent with the EU's long term goal of reducing emissions by 80-95 per cent, which was reaffirmed by EU leaders in February. It concludes that this would require a 25 per cent reduction in EU domestic emissions in 2020, rising to 40 per cent in 2030 and 60 per cent in 2040 (these reductions do not take account of the possible use of offset credits from outside Europe). The Roadmap reaffirms the EU's offer to take on a 30 per cent international target for 2020 if the conditions are right.

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<sup>4</sup> This evolving evidence base is captured in the IPCC's Assessment Reports, most recently the 2007 Fourth Assessment Report, which consists of the following three working group contributions: 'Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007'; Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds); 'Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change'; 2007 M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds); 'Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007'; B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds), all Cambridge University Press, and all available at [www.ipcc.ch](http://www.ipcc.ch).

37. The Government believes it is important that such a plan starts without delay, as this initiative can stimulate the right investment in low carbon infrastructure and technology, putting the EU on track for a low carbon future, maximising growth, jobs and prosperity.
38. The Commission's roadmap demonstrates both that the current 20 per cent EU target is not ambitious enough to achieve the 2050 goal, and that the EU already has the tools and policies to cut emissions. At a time when the price of oil is rising, putting in place an ambitious plan for Europe's low carbon future has wider benefits than tackling climate change. It will increase the continent's resilience against oil price spikes and reduce its dependence on imported energy. It will also help the EU compete with emerging economies in the fast-growing markets for green goods and services.

## The views of the Devolved Administrations

### The Scottish Government

39. The Climate Change (Scotland) Act puts in place parallel arrangements to those set out in the UK Climate Change Act. Specifically, where the UK Act requires that a UK carbon budget for the period 2023 to 2027 is set by the end of June 2011, the Scottish Act requires that annual targets for the same period are set by 31 October 2011. To support these timetables, the CCC will provide separate advice on Scottish targets in May/June 2011, in addition to the report already provided to the UK Government in December 2010. Scottish Ministers will consider this advice before a specific view on appropriate targets for that period is taken, and it will therefore be for the Scottish administration to bring forward proposals.
40. However, the Scottish Government has submitted some preliminary reflections on the CCC advice in February 2011. These views are summarised as follows:
  - The Scottish Government agrees with the CCC's analysis of the necessary scale of action across the UK. With a 42 per cent emissions reduction target for 2020, and a requirement that emissions fall by at least 3 per cent per annum thereafter, there is already a statutory requirement for emissions to reduce by around that level in Scotland.
  - The Scottish Parliament has already set a 42 per cent emissions reduction target for 2020 and would support any move by the UK Government towards higher levels of ambition. Clearly, EU action is crucial and we have a shared view of the need to encourage the EU to increase its 2020 target and tighten the Emissions Trading System cap.
  - The CCC suggests that the UK Government should accept the principle that international aviation and shipping emissions should be reflected in carbon targets, with specific recommendations on how to do so to follow in autumn of this year. International aviation and shipping emissions are already included within Scottish targets and Scotland would support any move to have them included in UK targets.

### Northern Ireland Executive

41. The Northern Ireland Executive has noted the CCC's recommendations and UK Government's plans to achieve reduction targets through the carbon budget process. The Executive published its own Greenhouse Gas Emissions Reduction Action Plan in February 2011 highlighting how Northern Ireland departments will achieve the NI Programme for Government target to reduce greenhouse gas emissions by 25 per cent below 1990 levels by 2025. This report identifies that to maximise emission reductions in a cost-effective way, all Northern Ireland departments must not only ensure

their actions and functions drive greenhouse gas emissions reductions but that they work together to realise this goal. Committed to this co-operative approach, the Executive broadly supports UK Government's efforts but notes that in driving a low carbon economy there must be a balance struck that ensures business competitiveness is maintained.

#### Welsh Government

42. The Welsh Assembly Government submitted views on the CCC's fourth carbon budget report in March 2011. The Welsh Assembly Government endorsed the CCC's advice and reiterated the importance of continuing to work collaboratively in the UK to reduce emissions and to demonstrate at international and European level the leadership that the Climate Change Act, the carbon budgets and comprehensive domestic action have embodied.

#### Next steps

43. The Government is laying in Parliament today, 24 May, its proposal for setting the level of the fourth carbon budget. Following Parliamentary decision and setting of the fourth carbon budget in legislation, the Government will publish a report setting out how it intends to meet the fourth carbon budget. As announced in DECC's Business Plan, Government intends to produce this report in October 2011.
44. The Government is also working on a number of other initiatives and publications that are closely related to the fourth carbon budget. We will publish the White Paper on the Electricity Market Reform before Parliamentary Recess, followed by the Annual Energy Statement and the revised version of the Carbon Plan in October, alongside the report on the fourth carbon budget.

## Annex A

### Matters to be taken into account in connection with setting carbon budgets

1. Part IV of the Impact Assessment provides evidence for consideration of wider matters that section 10 of the Climate Change Act 2008 requires Government to take into account when setting carbon budgets. These considerations are summarised in this Annex. The Impact Assessment does not cover specific policies and proposals to deliver the fourth carbon budget, therefore it considers wider impacts only at a high level. The Government will present more in depth analysis on sectoral and wider impacts as part of the October report, once the level of the fourth carbon budget has been set in legislation.

#### Scientific knowledge of climate change

2. The Government has reviewed and accepts the analysis submitted by the CCC in the December 2010 report on the fourth carbon budget. The CCC concluded that the fundamental science on the existence of climate change and its effects remains robust, and continues to grow and strengthen<sup>5</sup>. While uncertainties remain in the detail of how the Earth's complex climate system is responding to temperature increase, the case for taking action to tackle climate change is compelling. Global climate change is already happening and it is very likely that this is largely a result of human activity. Without action, there is a high probability that temperatures will rise well beyond two degrees Celsius, which is the level that world scientists suggest will avoid (but not eliminate) the most serious risks from climate change.

#### Technology relevant to climate change

3. The Government has reviewed and accepts the high-level insights that the CCC provided on the range of potential technologies that will play an important role in the transition to a low carbon economy and put us on a pathway to meet the 2050 target.

#### Power Sector

4. The UK has a wealth of renewable energy resources, both on and offshore. We also have a significant resource in waste going to landfill, which we want to exploit as much as is economically possible. The Government is firmly committed to push ahead with the deployment of renewable energy in the electricity, heat and transport sectors and will shortly publish a Renewables Roadmap for the implementation and deployment of new renewable energy capacity to 2020. The Government has also received advice from the CCC on the level of ambition for renewable energy beyond 2020 and will respond in due course.

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<sup>5</sup> This evolving evidence base is captured in the IPCC's Assessment Reports, most recently the 2007 Fourth Assessment Report, which consists of the following three working group contributions: 'Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007'; Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds); 'Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change'; 2007 M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds); 'Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007'; B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds), all Cambridge University Press, and all available at [www.ipcc.ch](http://www.ipcc.ch).

5. Nuclear power is a proven base-load technology and the Government continues to see an important role for it in the future low carbon energy mix. However, safety is paramount and, following the unprecedented events in Japan, the Secretary of State for Energy and Climate Change has asked UK Chief Nuclear Inspector, Dr Mike Weightman, to provide a thorough report to the Government on the implications and the lessons to be learned for the UK nuclear industry. Dr Weightman has delivered an interim report in May and the final report will follow in June.
6. In the medium term, coal and gas will remain important for electricity generation. Carbon Capture and Storage (CCS) technology is vital because it will enable coal and gas to continue to play a role without jeopardising our emissions reduction target, thereby meeting our security of supply needs and giving the UK a head-start in a technology that could be exported across the world. The Government is committed to public sector investment in CCS technology for four demonstration projects and to establishing an Emissions Performance Standard to set limits on carbon dioxide emissions from coal-fired power stations. The Government has announced up to £1 billion in capital expenditure for the first demonstration project which is aiming to be operational in 2014/15. DECC is developing a process to select the three further projects by the end of 2012.

#### Transport sector

7. The main source of abatement potential in transport in the near future is from improving the fuel efficiency of vehicles. The Government strongly supports and encourages the further development of the EU policy frameworks in this area. Electrification of transport through battery electric, hybrid or fuel cell vehicles also provides significant opportunities for reducing the carbon emissions from light vehicles in particular. To supplement these improvements, there are further abatement opportunities from sustainable biofuels and technological development of vehicles.

#### Domestic and Non-domestic sectors

8. Emissions from energy use in buildings and industry can be reduced through energy efficiency improvements to existing and new building stock, and through the introduction of low-carbon heat sources alongside reductions in carbon intensity of electricity generation. In the domestic sector, there will be a need to decrease demand for energy in existing housing by improving insulation and replacing inefficient boilers, as well as measures to help householders change behaviour. Some technologies that help achieve this, such as cavity wall insulation or condensing boilers, are well established and are already being deployed in large numbers. Others, such as solid wall insulation, are being deployed in smaller numbers at the moment, though this is likely to change as technological, financial and behavioural barriers are addressed. New housing is already relatively energy-efficient, and this is projected to improve further with the move towards zero-carbon homes.
9. The challenge of deploying appropriate technologies to decrease emissions from non-domestic buildings is greater than in the domestic sector, partly due to the diversity of non-domestic uses, but also due to the complexity of heating and ventilation systems. As with the domestic sector, the provision of real-time information on energy use and better control of energy using systems is important.
10. Emissions cuts that go beyond short-term efficiency improvements will require the introduction of new technologies for heating. Currently, fossil fuels meet virtually all UK energy consumption for heating purposes, with natural gas providing over 70 per cent. To meet our renewables and emissions targets we will need a shift away from our current reliance on fossil fuel based heating towards alternatives such as air and ground source heat pumps, biomass boilers, and use of 'wasted'

heat from industrial and commercial processes. It is likely that electric heating – in the form of heat pumps, which are able to concentrate external heat for internal space and hot water heating, – will be a lead technology. However, finding solutions on heat supply across all sectors in society will be complex with location, property density, and end-use being key considerations.

### Industry Sector

11. In industry, there is a wide variety of different processes that have potential for industry-specific improvements. Significant progress has already been made in implementing incremental energy efficiency within existing industrial processes, mainly due to the share of energy cost in industrial production costs. In the medium to long-term, larger scale investments in new technologies, processes and products to reduce emissions such as the application of industrial CCS, fuel switching to renewable heat or increased electrification of industrial processes should become feasible and economically viable, alongside the creation of new business models that support greater material efficiency.

### Economic and fiscal circumstances

12. Setting carbon budgets gives a strong signal to investors as to the future level of required emissions reductions. The EU Emissions Trading System provides such a signal for the power sector and heavy industry, and the reforms that Government will put forward under the Electricity Market Reform will provide further and stronger certainty for investors, enhancing UK resilience against the volatility of world fossil fuel markets.
13. Investment in the non traded sector is also crucial to bringing forward key technologies to tackle climate change. A strong signal to investors should increase the expected returns for investments in low carbon infrastructure and may stimulate additional investment. Such investment will be crucial to meet our longer-term targets and to lower the cost of technologies required to tackle climate change.
14. The Stern report in 2006 demonstrated that the costs of taking action on climate change are likely to be less than the costs of inaction. The CCC report concluded that meeting the proposed level of the fourth carbon budget domestically would cost under one per cent of GDP in 2025. This is based on an assessment of resource costs – in other words, the costs of introducing specific technologies, including up-front capital costs and operating costs, and also taking into account any benefits from fuel savings.
15. While some studies focus on the negative impact on GDP of tighter greenhouse gas targets and the measures to tackle climate change, these studies often fail to account for a number of factors that may have a positive impact on GDP. These factors include gains from reduced exposure to volatile fossil fuel prices, co-benefits including improved air quality and impact of social health, reduction in the output gap, a move towards high growth sectors, double dividends and innovation benefits.
16. Finally, there may be additional benefits due to positive spill-over effects associated with innovation. Such innovation, which will be higher in immature low carbon technologies than existing infrastructure, is thought to be key to maintaining long-term economic growth.
17. These impacts cannot be attributed solely to setting the fourth carbon budget, and the impacts will depend crucially on the policies implemented to meet the budget.

18. Many different factors, both domestic and international, determine the competitiveness of UK companies, including relative wage, energy and other variable costs, productivity, technological development, and exchange rates. Some policies to reduce emissions to meet the fourth carbon budget could enhance our industrial competitiveness in some sectors, while others might have a negative impact, particularly in the short term if they increase costs. The report on proposals and policies in October, which will set out how the Government intends to meet the fourth carbon budget, will consider the impact on industrial competitiveness in more detail.
19. Some sectors such as energy intensive industries and agriculture may potentially be at risk from “carbon leakage” (where industries relocate either production or investment to an area without similar carbon constraints), which could in turn lead to an increase in overall global emissions. The risk of carbon leakage depends on the ability of the sector concerned to pass on costs without losing market share, its degree of exposure to international competition and the extent to which competitors face similar carbon costs. Published research suggests that the risk of carbon leakage is confined to a limited number of sectors.
20. Meeting the fourth carbon budget requires no new policies this Parliament, and thus is consistent with the Government’s deficit reduction plans as set out at Budget 2011 and the Spending Review. In the longer term, the fiscal impact will be taken into consideration when deciding on the mix of policies used to meet the budget.

#### Social circumstances

21. Delivering the fourth carbon budget will incur cost and the social implications of meeting the budget will depend on how these costs are distributed. Climate change policies to meet the fourth carbon budget could add to electricity and gas prices where the costs are passed on by energy suppliers to their customers. However, the Government is already providing support to more of the most vulnerable households to keep warm at an affordable cost.
22. Improving the thermal efficiency of the housing stock is usually the most effective and sustainable method of alleviating fuel poverty. Upgrading the housing stock is a gradual process and Government therefore has a number of policies in place to provide more immediate support for vulnerable households. These include the Winter Fuel Payment, the Cold Weather Payment, and the Warm Home Discount scheme.
23. DECC published an assessment of the impact of energy and climate change policies on gas and electricity prices and bills alongside the Annual Energy Statement (AES) in July 2010. This assessment will be updated and published alongside the 2011 AES later this year.

#### Energy policy considerations

24. Emissions reductions to achieve the proposed fourth carbon budget will require action across the economy, including the electricity, oil and gas sectors. The overall impact should be to reduce both the UK’s energy use and intensity, although there are likely to be increases in electricity demand due to ‘fuel-switching’, e.g. through the electrification of cars and trains or increased use of heat pumps instead of gas heating.
25. The EU ETS is expected to continue to limit overall emissions from fossil fuel fired power stations through the fourth carbon budget period. The Electricity Market Reform White Paper will soon propose the Government’s approach to capacity mechanisms to ensure security of supply in spite of intermittent renewable generation. It is likely the UK will retain a degree of fossil fuel generation to address peak demand.

26. The level of the carbon budget set in the non-traded sector should help transfer demand from fossil fuels to renewables. This should increase fuel diversity, which would enhance energy security, provided reliable supply chains for those alternative fuels are established.

#### Differences between England, Wales, Scotland and Northern Ireland

27. There are a range of factors that influence the scale of and scope for emissions reductions in the different parts of the UK, such as the scope for energy efficiency improvements given the current condition of the housing stock, and the cost-effective opportunities for expanding public transport networks in rural areas.
28. The CCC identified significant abatement opportunities at the national level across all of the key technology options, ranging from renewable electricity, energy efficiency, low carbon heat, more carbon efficient vehicles, agriculture and land use. According to the CCC there is scope to reduce direct emissions in the devolved administrations by around 48% in Scotland, 36% Wales and 49% in Northern Ireland
29. The Devolved Administrations in Northern Ireland, Scotland and Wales hold a number of key policy levers which influence emissions reduction potential. These include powers over planning for infrastructure investments, promoting energy efficiency and, in Scotland, setting building standards. The UK Government and Devolved Administrations will continue to work closely together in order to meet shared goals of reducing greenhouse gas emissions.

#### Circumstances at European and international level

30. The UK is amongst the 195 countries that form part of the UNFCCC. The UK is a proactive member in international negotiations and strongly supports the international process to work towards an ambitious global climate deal that will limit emissions and explore the creation of new international sources of funding, for the purpose of climate change adaptation and mitigation.
31. At European level the Government is strongly supportive of a European Union move to a more stringent 30 per cent emissions reduction target by 2020 from the current 20 per cent target. We are urging all Member States to start discussing the implementation of the European Commission's Roadmap to accelerate the European transition to an internationally competitive low carbon economy. When this happens, the UK will look to amend its second and third carbon budgets to reflect this greater level of ambition.
32. The proposed level of the fourth carbon budget is consistent with what the UK needs to do to play its part in international efforts to keep global temperatures from rising more than two degrees Celsius. Our analysis confirms that the proposed level of the fourth carbon budget is also consistent with the proposed trajectory set out by the European Commission in its March 2011 Roadmap. However, as mentioned earlier, the Government will review progress towards the EU emissions goal in early 2014 and revise the carbon budget if necessary.

#### International aviation and shipping

33. The Climate Change Act currently excludes emissions from international aviation and shipping. The Act states that the Government must take these emissions into account in setting carbon budgets.

34. In the December 2010 report on the fourth carbon budget, the CCC recommended ‘that Government should accept the principle that international aviation and shipping emissions of carbon dioxide will be included in carbon budgets’ but that ‘further assessment is required in order to determine the appropriate approach to potentially significant non-CO<sub>2</sub> emissions and effects’.
35. The Act requires the Government to set out the circumstances and the extent to which these international emissions should be included before the end of December 2012, or explain to Parliament why they have not been included.
36. The scenarios of international aviation and shipping CO<sub>2</sub> emissions used in the Impact Assessment for the proposed level of the fourth carbon budget are outlined below<sup>6</sup>. Due to methodological differences, this illustrative scenario should not be compared with the international shipping emissions that the UK reports in the national emissions inventory. The Government will be publishing updated forecasts of UK aviation CO<sub>2</sub> emissions later this year:

International Shipping (MtCO <sub>2</sub> ) Pathway Analysis	2023	2024	2025	2026	2027	Total 4th CB Period
	13.9	14.4	14.8	15.3	15.8	74.1
International Aviation (MtCO <sub>2</sub> )	2023	2024	2025	2026	2027	Total 4th CB Period
CCC Likely Scenario	45.7	46.0	46.3	46.6	46.9	231.6
CCC Optimistic Scenario	43.6	43.8	44.0	44.3	44.5	220.1
CCC Speculative Scenario	41.3	41.4	41.5	41.5	41.4	207.0

<sup>6</sup> Annual figures for international aviation have been interpolated from the CCC’s analysis, which provides estimates for emissions in 2020, in 2025 and in 2030.





