WORLD RESOURCES INSTITUTE

Committee on Climate Change

Working Paper

GHG MITIGATION IN THE UNITED KINGDOM: AN OVERVIEW OF THE CURRENT POLICY LANDSCAPE

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EXECUTIVE SUMMARY

Domestic legislation – the Climate Change Act 2008 – commits the United Kingdom to an 80 percent emission reduction by 2050 on 1990 levels, and to a system of 5-year carbon budgets to progress toward that target. These carbon budgets require UK emission reductions on 1990 levels of 34 percent by 2020 and 50 percent by 2025. The Carbon Plan, published in December 2011, sets out the UK Government's plans to keep within its carbon budgets. An independent body – the Committee on Climate Change – advises the government on the setting of carbon targets, and reports to Parliament annually on progress. The UK also has commitments under EU-wide emission reduction targets.

This report summarizes key UK policies already enacted and in development that are likely to reduce greenhouse gas (GHG) emissions across the UK, discusses the implications of the current policy scenario for the country's GHG trajectory, and identifies issues to watch going forward. Policy measures currently in place to reduce UK GHG emissions include the EU Emissions Trading System (EU ETS), a key policy lever covering emissions from power generation and energy-intensive industry; the EU Renewable Energy Directive, under which the UK has a target to increase the share of renewables in final energy to 15 percent in 2020; and energy efficiency programs for residential buildings, requirements to reduce average new car and van emissions, and a range of other measures across the rest of the economy, not covered by the EU ETS.

CONTENTS

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About this Series

This working paper is part of a series that provides an overview of the current policy landscape that key countries have pursued in the interest of GHG mitigation. For each country, the series:

- Describes the country's international mitigation pledge (e.g., GHG reduction commitment, Nationally Appropriate Mitigation Action), including assumptions and conditions associated with the pledge, and in what respect – if any – it is codified domestically
- Outlines the country's key government institutions and legal authorities for mitigating climate change
- Outlines major policy instruments related to GHG mitigation, current, and under development
- Explains what is known about the country's GHG trajectory
- Identifies issues to watch in the coming years

Our analysis and the government's own projections[1] suggest the UK is on course to meet its carbon budgets out to 2022 – and, consequently, its share of the EU's commitment under the UNFCCC. Meeting the fourth carbon budget (2023–27), however, will require a further acceleration of emission reduction, suggesting the need for emissions in the third budget period (2018–22) to be significantly below the legislated level. To secure such an outcome requires strong and timely implementation of additional measures, with quicker delivery than in the past.

If future carbon budgets are to be met, progress in emission reduction must accelerate. The government is moving forward with plans to reform the electricity market through a system of long-term contracts designed to give greater confidence in investment in low-carbon generation. A new flagship energy efficiency policy – the Green Deal and Energy Company Obligation – is being introduced. It is not clear whether this will deliver on the required scale. Looking forward, key issues will be around the strength of implementation of policies currently being developed (especially electricity market reform and the Green Deal) and the review of the fourth carbon budget (covering emissions in 2023–27), which the government plans to undertake in 2014.

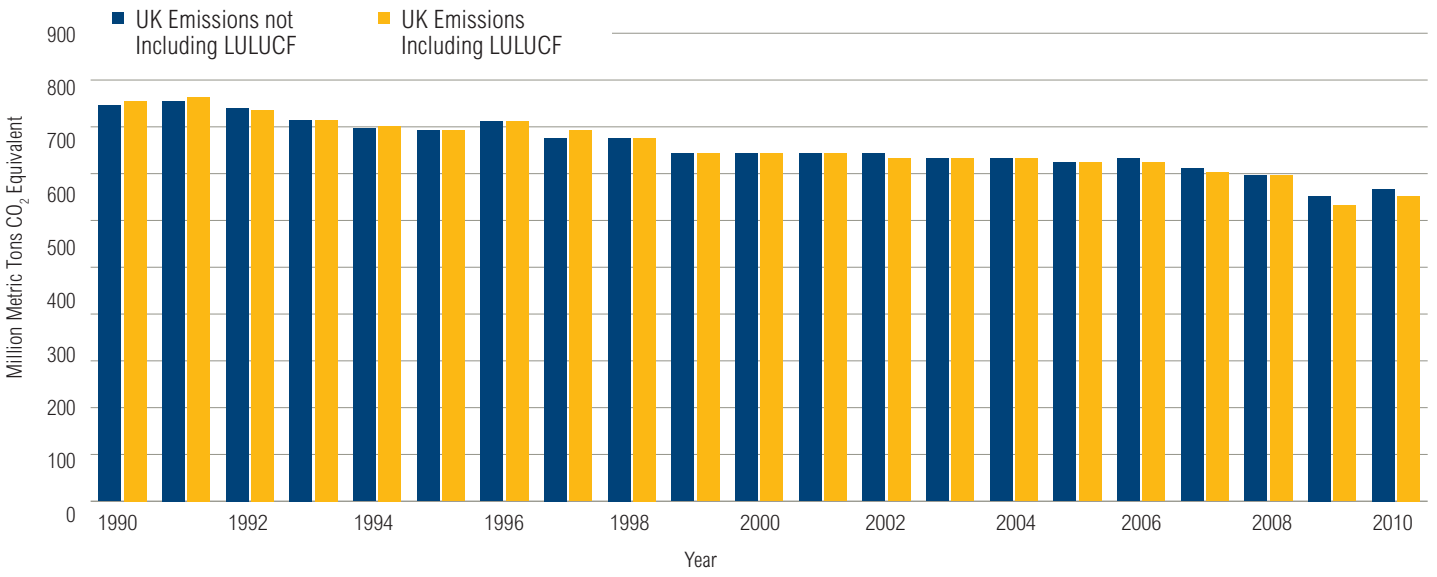
KEY METRICS

In Figure 1, United Kingdom GHG emissions[2] have decreased approximately 23 percent since 1990.

In Figure 2, UK per capita emissions in 2010 were 32 percent and 16 percent below 1990 and 2005 levels, respectively. Meanwhile, UK GHG emissions intensity[3] declined 53 percent between 1990 and 2010. Underlying these trends is a 9 percent increase in the population and a 57 percent increase in GDP[4] since 1990.

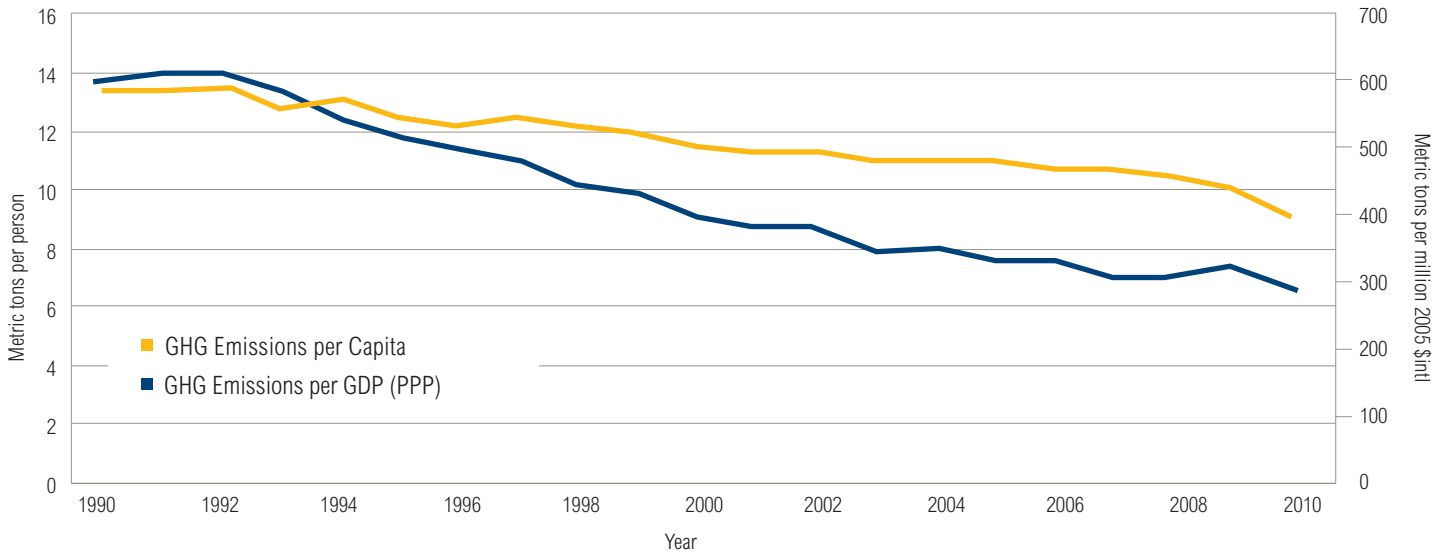
In Figure 3, the total consumption and share of coal and petroleum in the UK energy profile has decreased since 1990. In 2010, renewable energy (including hydropower, wind, solar, geothermal, and biomass) made up 4 percent of all energy consumption in the United Kingdom, increasing its share from less than 1 percent in 1990.

Figure 1 | Total UK GHG Emissions



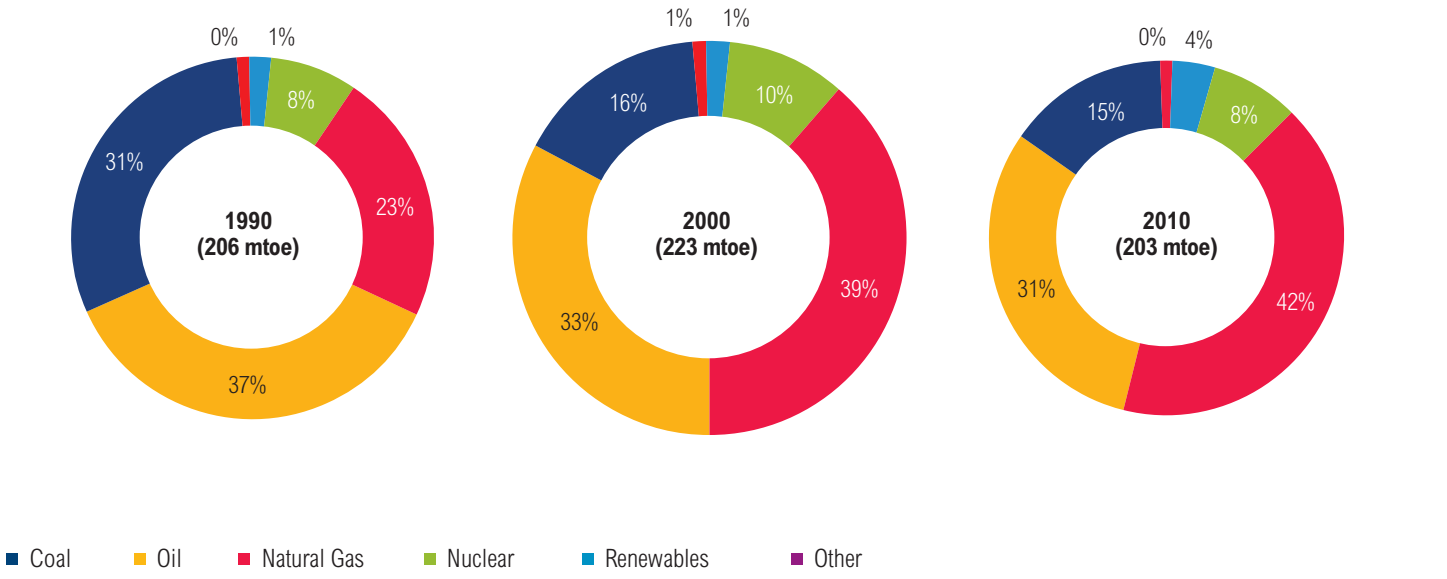
Source: UNFCCC Data Interface, 2012.
Note: Totals include GHG emissions of all "Kyoto" gases in each reported sector, where applicable, as required by the UNFCCC for Annex I countries.

Figure 2 | United Kingdom GHG Emissions per Capita and GHG Emissions Intensity



Source: Calculated using UNFCCC 2012 and World Bank World Development Indicators, 2012-10-14.
Note: GHG emissions totals include land use, land-use change, and forestry.

Figure 3 | **UK Fuel Mix: 1990, 2000, and 2010**



Data Source: International Energy Agency
Note: Size of circles indicates total consumption in million tonnes of oil equivalent (mtoe).

I: INTERNATIONAL STATEMENTS OF FUTURE GHG MITIGATION

International Mitigation Pledge Under the United Nations Framework Convention on Climate Change (UNFCCC)

The UK is a party to the UNFCCC and also has an international commitment to emission reduction as part of the EU. The EU agreed, in December 2008, to a 20 percent GHG emission[5] reduction target in 2020 relative to 1990. The commitment is legally binding, with effort shared across EU countries. Part of the commitment is delivered by the EU Emissions Trading System (EU ETS), covering the power sector and heavy industry (referred to here as the traded sectors), for which the UK share of the cap falls 29 percent from 2005 to 2020. For sectors not covered by the EU ETS (referred to here as the nontraded sectors – principally surface transport and heat for buildings), the UK agreed as part of the burden-sharing agreement with the EU to a 16 percent reduction in GHG emissions by 2020 as against 2005 levels. Taken together, the UK's obligations under the traded and nontraded sectors amount to a 34 percent GHG reduction from 1990 levels by 2020. Further information regarding the EU commitment and relevant EU policies is available in a separate assessment (Cludius et al. 2012).

Box 1 | **Conditions Underlying the EU GHG Pledge**

Conditions of International Reduction Goal:
- Unconditional, but ultimate target is dependent on EU agreements

Sectors Covered:
- All sectors identified by the IPCC except international shipping and LULUCF

Gases Covered:
- CO_2, CH_4, N_2O, HFCs, PFCs, SF_6

Use of Domestic or International Carbon Credits:
- Allows options to "buy in" to EU ETS and other carbon trading schemes

Table 1 shows relative reductions from the legislated economy-wide carbon budget, for base years 1990, 2000, and 2005.[6]

Table 1 | **UK Pledged GHG Emissions Reductions by 2020**

BASE YEAR	ABSOLUTE CHANGE (2020 ON BASE YEAR)	PER CAPITA CHANGE (2020 ON BASE YEAR)	INTENSITY CHANGE (2020 ON BASE YEAR)
1990	-34% including and excluding LULUCF	-42% including and excluding LULUCF	-60% to -65% including LULUCF -40% to -65% excluding LULUCF
2000	-25% Including and excluding LULUCF	-32% including and excluding LULUCF	-45% to -53% including LULUCF -28% to -53% excluding LULUCF
2005	-22% including LULUCF -23% excluding LULUCF	-29% including LULUCF -30% excluding LULUCF	-38% to -45% including LULUCF -21% to -45% excluding LULUCF

Note: Data sources and calculation methodology based on Levin and Bradley 2010.

Conditions and Assumptions Underlying the International Pledge

The EU has further stated its readiness to move to a 30 percent mitigation target in 2020 if other developed countries commit to comparable goals. The UK Government has expressed its view[7] that the EU should move now to such a 30 percent reduction target.

Domestic Codification of the International Pledge

Carbon budgets

The Climate Change Act of 2008 sets a legally binding target for the UK to reduce GHG emissions (excluding those from international aviation and shipping) by at least 80 percent below 1990 levels by 2050. This extends much further ahead than its EU commitments. To help drive progress toward the target, the act also establishes a system of carbon budgets – legally binding limits on the amount of emissions in successive 5-year periods starting in 2008.

Currently, carbon budgets have been legislated out to 2027 (Table 2). The level of the third carbon budget (2018–22) in the UK was set to be consistent with the UK's commitment from the EU burden-sharing agreement.

The fourth carbon budget, legislated in June 2011, requires emissions in 2025 to be 50 percent below 1990. Both this budget and the 2050 target are broadly consistent,[8] as proposed by the CCC and in the view of the UK Government, with a cost-effective UK contribution to global action consistent with a climate objective to limit global temperature increase to 2°C.

Carbon accounting rules are set such that carbon savings are attributed to either the traded sector (TS) or the nontraded sector of the economy.

- The traded sector (around 40 percent of emissions) comprises emissions covered by the EU ETS – principally the electricity generation sector and heavy industry. The UK's share of the EU-wide cap represents the traded sector component of the UK carbon budget. As such, this component of the budget should always be met (i.e., if gross emissions are above the UK share of the cap, the budget will be achieved on a net basis through purchase of allowances as required by the EU ETS).

- The nontraded sector (around 60 percent of emissions) comprises emissions from other sectors of the economy – mainly emissions from heat for households and business, plus surface transport. Carbon savings for the nontraded sector may be driven by a variety of policy measures and are key to meeting the carbon budget.

The UK has said it will make every effort to meet the budget through domestic action, but to maintain flexibility – including for the nontraded sector component of the budget – it retains the option of trading to "buy in" allowances under the EU ETS or other schemes[9] (e.g., the Clean Development Mechanism).

If a carbon budget is missed, there is no immediate financial penalty. The government could choose to purchase allowances in the EU ETS or other carbon credits. It would be required to submit reports to Parliament setting out reasons for any shortfall, the amount involved, and proposals to compensate in future periods for these excess emissions.

Table 2 | **Legislated UK Carbon Budgets**

	CARBON BUDGET			
Year	2008–12	2013–17	2018–22	2023–27
Level of budget ($MtCO_2e$)	3018	2782	2544	1950
Reduction (midbudget) below 1990, %	23	29	34	50

As noted above, the UK Government has expressed its view that the EU should move beyond the pledge to reduce emissions in 2020 by 20 percent compared with 1990 levels, to a 30 percent reduction commitment. Should that happen, it has signaled its intent to tighten the UK's second and third carbon budgets[10] to reflect this higher level of ambition.

If the EU does not progress toward the 30 percent commitment, and to tightening the EU ETS as part of this, the government has stated that it will look again at the level of the fourth carbon budget (1950$MtCO_2e$ over the years 2023–27), potentially to revise the budget upward (i.e., loosen the budget) to align with the EU trajectory. This fourth budget review will take place in 2014.[11]

Committee on Climate Change

Aside from establishing a long-term legally binding target for emissions, the Climate Change Act established the Committee on Climate Change (CCC) – made up of experts from relevant fields such as climate science and economics – as an independent adviser on carbon budgets. In particular, the CCC has duties, defined in the act, to:

- Advise the government on the level of carbon budgets and how these can be met; and
- Report to Parliament, annually, on progress in reducing emissions in line with the legislated budgets.

The government does not have to accept the CCC's advice, but it is heavily constrained to give serious attention to its views.

- If the government wishes to set a carbon budget at a different level to that recommended by the CCC, it must publish a statement setting out the reasons for that decision.
- A response to points raised by the CCC's annual progress report must be made before Parliament.

So far, the CCC's recommendations on levels of the first four budgets, to 2027, have been accepted and legislated. Most recently,[12] the CCC has recommended that the UK's share of emissions from international aviation and shipping be included in carbon budgets and in the 2050 target.

Domestic action plans that support these commitments

Under the Climate Change Act the government has an obligation to report to Parliament on what it is doing to meet carbon budgets. The UK Carbon Plan,[13] published in December 2011, sets out how the government intends to meet the first four legislated budgets. These carbon policies are outlined further in the second section of part III, "Existing Policies." The UK Carbon Plan also describes the roles of the devolved administrations of Scotland, Wales, and Northern Ireland.

Scotland's Act[14] requires that after setting each batch of annual targets, Scottish ministers must produce a report setting out proposals and policies for meeting those targets, and describing how they contribute to the interim and 2050 targets. The first of these reports was published in March 2011, while the second is due later this year.

The Welsh Government published its climate change strategy in 2010.

The Northern Ireland Executive has published its GHG action plan, outlining how each department in the Executive will contribute to meeting the target to reduce emissions by 25 percent relative to 1990 by 2025 (the target has since been increased to a 35% reduction).

Reviews of progress in emission reduction and policy development in the devolved administrations have been published by the CCC.[15]

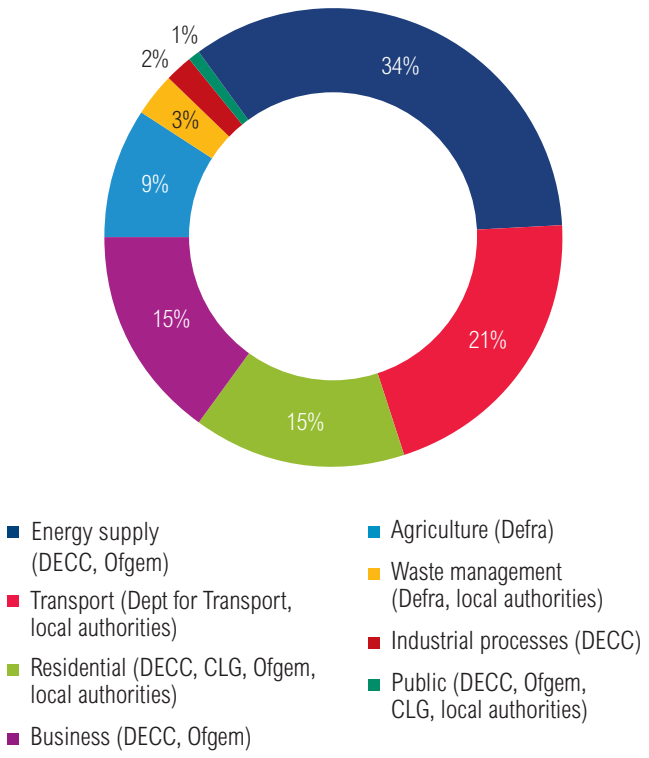
II: RELEVANT GOVERNMENT INSTITUTIONS AND LEGAL AUTHORITIES

Relationship with the EU

In general terms, both energy and environmental issues are areas of "shared competence" between the union and member states. The EU should be expected to act in instances when it is more effective to act at that level than at the national, regional, or local level. Member states will then exercise their competence to the extent that the union has not.

As noted above, the EU 2020 Climate and Energy package (December 2008) included an agreement on member state emission reduction targets for nontraded sectors (the Greenhouse Gas Sharing Decision). The UK agreed to a 16 percent reduction target (2020 on 2005). Subject to EU directives (e.g., emissions performance standards for new cars and light vans; energy performance of buildings), for the nontraded sectors member states are responsible for defining and implementing policies and measures to limit emissions to their target. The traded sectors are regulated at the EU level through the EU ETS.

Figure 4 | **Key Sectors and Legal Authorities**



Source: DECC, Own Illustration

Devolved administrations

Certain UK government powers are devolved to the national governments of Scotland and Wales and to the Northern Ireland Executive. These include powers over planning for infrastructure investments, promoting energy efficiency, and setting building standards.

The Climate Change (Scotland) Act (2009) created the statutory framework for reducing Scottish emissions. It differs in several respects from the framework for the UK as a whole. First, Scotland has legislated a tighter reduction in emissions in 2020 than the UK (42% and 34% relative to 1990, respectively). Second, the Scottish Act requires that targets be set on an annual basis, from 2010 to 2050 (as opposed to 5-year carbon budgets), and also requires that emissions fall by at least 3 percent a year from 2020 onward. Furthermore, Scottish targets include emissions from international aviation and shipping, which are currently outside the UK budget.

The Welsh Government has a target to reduce emissions by 3 percent each year from 2011 in areas of devolved competence. It has endorsed the UK Government's decision to accept the CCC's advice for the fourth budget; the Northern Ireland Executive broadly supported this acceptance, noting the need to ensure maintenance of business competitiveness in driving the move to a low-carbon economy.

Local authorities

Local authorities also play an important part in meeting carbon reduction targets. They can drive and influence GHG reduction through the services they deliver; their roles as social landlords, community leaders, and major employers; and their regulatory and strategic functions. These contributions (by local authorities in England, but with wider relevance at UK level) are explored in How Local Authorities Can Reduce Emissions and Manage Climate Risk (CCC 2012c).

Relevant authorities by economic sector are listed in Figure 4.

III: OVERVIEW OF MAJOR POLICIES

Introduction and Approach

In the following section, we focus on national policies that create mandatory requirements or financial incentives. In the subsection "existing policies" we examine progress made and expected from existing measures – meaning, in general, that the policy has been enacted and its provisions are well defined. References to associated emissions savings are included, but a full breakdown of UK Government estimates of emission savings by measure is available in DECC 2011d. There are also a number of important additional policies to which the government is committed but which are currently in development. These policies are covered in the subsection of this paper titled "policies under development".

A more comprehensive review of the UK's full range of existing measures can be found in the UK Carbon Plan, which sets out how the government intends to meet the legislated carbon budgets. In reviewing policies and progress made, we take the CCC's third and fourth progress reports[16] to Parliament as key sources. The CCC framework aims to track progress against a range of indicators it has established to monitor progress toward achievement of carbon budgets; these indicators form an important basis of this assessment. A summary list of the policies discussed in this section is provided in Table 3.

Existing Policies

Measures in the traded sector

At 221 $MtCO_2e$ in 2011, traded sector emissions are below the UK share of the EU ETS cap (246 $MtCO_2e$). Emissions fell by 7 percent in 2011, driven by reductions in both power and industry.

Across the EU, significantly less effort is being made to meet the EU ETS cap than was envisaged when the cap was set. This is primarily a reflection of the recession. In 2011 the carbon price was low, averaging around €13/tCO_2, providing limited incentive to further reduce emissions. The price subsequently fell further, to only around €7/tCO_2 as of July 2012.

While the EU ETS provides a price signal, it is generally recognized that carbon pricing on its own will be insufficient to tackle barriers to emission reduction and bring forward low-carbon investment. Additional measures are required.

POWER SECTOR

The power sector is fundamental to achieving carbon budgets, with the CCC having recommended an almost complete decarbonization of the sector by 2030. Since 1990 the overall trend has been toward a less carbon-intensive mix, with a switch from coal to gas and, recently, some increase in renewables.

Under the EU Renewable Energy Directive, the UK has a target to increase the share of renewables in final energy to 15 percent in 2020, from around 3 percent in 2010. Since cost-effective opportunities in the rest of the economy are less, achieving this is likely to require around 30–35 percent of electricity generation from renewables. The main policy mechanism to meet this goal is the renewable obligation certificate (ROC) regime, under which electricity suppliers are required to purchase renewable generation. Below are the regime's principal characteristics.

- ROCs are issued to generators for every megawatt hour (MWh) of eligible renewable electricity they generate (in Great Britain, ROCs are issued by the energy regulator Ofgem, the Office of Gas and Electricity Markets).
- Suppliers are required to surrender ROCs at a level consistent with an increasing share for renewables to 2020 (e.g., the target for 2011–12 is that 12.4% of electricity supplied should come from renewables, rising to 15.4% by 2015–16).
- Generators sell their ROCs to suppliers and thus receive income from their renewable generation on top of their earnings in the wholesale electricity market.
- If not enough ROCs are available, suppliers may instead pay a buyout price set by the government, with the revenue recycled to renewable generators.

Although the power sector's generation from renewables progressed in 2011, investment will need to increase substantially by the end of the decade if the sector is to generate 30 percent from renewables by 2020, the level viewed by the CCC as necessary to help the UK meet the Renewable Energy Directive. Some of the highlights of progress in the past 5 years include:

- The percentage of electricity from renewables has increased from 4.8 percent in 2007 to 7.4 percent in 2010 and 8.7 percent in 2011.

Table 3 | **Selected Policies in the UK that are Likely to Reduce Domestic GHG Emissions**

SECTOR	POLICY NAME
Cross-cutting Economic Incentives	■ EU Emissions Trading System; ■ Climate change levy (energy tax)
Power Sector	■ EU Renewable Energy Directive ■ Renewable obligation certificates (ROCs) ■ Carbon capture and storage competition ■ Nuclear national planning statement ■ Electricity market reform ■ Carbon Emission Reduction Target ■ Green Deal and Energy Company Obligation
Industry	■ Climate change agreements ■ Inclusion in CCS competition
Buildings	■ Energy performance certificates ■ Display energy certificates ■ Carbon reduction commitment ■ Renewable heat incentive ■ Warmfront ■ Community Energy Saving Programme
Transport	■ EU new car and van emission targets ■ Renewable transport fuel obligation ■ Plug-in car grant ■ Plugged-in Places program
Waste	■ EU Landfill Directive ■ Landfill tax
Agriculture, Forestry, and Other Land Use	■ Agriculture industry action plan - voluntary

Note: Grey denotes policies currently under development.

- 4.6GW onshore and 1.8GW offshore wind capacity was installed and operational at the end of 2011.

- Around 4GW of offshore and 5.6GW of onshore wind projects were in or awaiting construction. This would be enough to support a level of capacity additions over the next 5 years consistent with the required rollout.

- Projects with significant capacity are currently in the planning system (over 8GW onshore and 2.5GW offshore), though it is not clear that they will be approved quickly enough.

The Scottish Government has set a goal that by 2020 all of Scotland's annual electricity consumption should be matched by an equivalent amount of electricity from renewable sources. Since Scotland is a substantial net exporter of power to the rest of the UK, this is compatible with a significant amount of thermal generation on the system in Scotland in 2020. The Scottish Government has, however, estimated that meeting its target will require the installed capacity of renewables in Scotland to increase from 4.6 GW currently to between 14 and 16 GW by 2020.

In the effort to develop carbon capture and storage (CCS), the UK Government has allocated up to £1billion for a demonstration project. Failure by a first demonstration competition to award funding has led to substantial delay, but progress has been made in several areas:

- A selection process for commercial scale projects was launched in April 2012. This is open to electricity generators, including those generating through gas CCS, and industrial emitters as part of a cluster.

- For further pilots, seven applications have been made for EU funding.

- The Department of Energy and Climate Change (DECC) has published a CCS roadmap[17] that sets out further steps, including funding R&D and commitment to work with industry in developing skills and CCS infrastructure.

It will be crucial to maintain the momentum that now exists and deliver these CCS projects toward the beginning of the 2016–20 period set out by the government. Such progress, combined with development of a strategic approach to CO_2 infrastructure, could allow CCS to play a valuable role in power sector decarbonization by the 2020s.

The government's position in relation to new nuclear generation is that nuclear should play an important role in the UK's future energy mix and that new stations can be built, provided they are subject to the normal planning process for major projects. There are no plans to publicly subsidize the construction of new nuclear plants.

A number of actions have been taken to facilitate new investments.

- A nuclear national planning statement was designated in July 2011 and lists eight sites as suitable for new nuclear power.

- Regulatory justification has been given effect by statutory instruments, confirming the Department of Energy and Climate Change (DECC) secretary of state's decision that the AP100 and European pressurized reactor (EPR) designs are justified and have benefits that outweigh health risks.

- Generic design assessments are being taken forward, examining new reactor designs for safety and environmental clearance, and taking into account lessons from the accident at the Fukushima Dai-Ichi plant in Japan.

Given these actions and with progress in other areas, it is possible that the first new nuclear station could be generating power by the end of the decade.

INDUSTRY

UK industry emissions have fallen significantly since 1990, primarily because of fuel switching, a shift in composition of the UK economy away from heavy industry and, more recently, the recession. However, industry emissions still account for a large share of UK GHG emissions (34%),[18] with a number of energy-intensive sectors such as iron and steel dominating the picture. In principle, energy cost concerns should motivate industry to reduce emissions. However, there is little evidence that measures have brought emissions down much at all – recent observed reductions are primarily the result of the recession. Two principal factors currently affect emissions in the industry sector.

- The EU ETS carbon price signal is low and has a short timeframe. This creates few incentives to reduce emissions over the long-term, particularly where capital is constrained.

- Climate change agreements (CCAs) between the government and energy-intensive companies provide an exemption to the climate change levy (an energy tax levied on industry, commerce, and the public sector) in return for agreed emission reduction. In the most recent review period, the majority of sectors (36 of 52) met their annual carbon reduction targets. However, it is debatable whether targets were sufficient given the underlying abatement potential, and whether targets were met primarily as a result of CCAs or other factors (e.g., energy prices, levels of demand).

Measures in the nontraded sector

The main areas covered in this section are emissions attached to demand for heating in buildings, road transport, waste, and agriculture.

In the nontraded sector, the CCC's indicator framework for judging progress in the first carbon budget period is relatively unambitious because policy development and delivery generally has a lead time of several years. This will need to be accelerated significantly going into the second and third budget periods, and again into the fourth budget.

The latest data for 2010 and 2011 suggest mixed progress in implementing abatement measures.

- Professional installations of loft and cavity-wall insulation increased in 2011 relative to 2010. Levels of solid wall insulation rose but remained very low.
- There has been very limited investment in renewable heat technologies.
- Boiler replacement is ahead of schedule, reflecting a scrappage scheme operated in 2010.
- Emissions intensity (gCO_2/km) of new cars in 2011 was significantly below levels in the CCC's indicator framework.

BUILDINGS

Residential buildings

Much of the UK building stock consists of old, badly insulated buildings whose energy efficiency can be much improved, in particular through fabric insulation. For residential buildings, the main current policy to improve energy efficiency is the Carbon Emission Reduction Target (CERT), which requires energy suppliers to implement measures to reduce emissions (e.g., by offering subsidized insulation to households). This was extended in July 2010 to the end of 2012. By December 2011 it had achieved 78 percent of its CO_2 target and 42 percent of its insulation target.

Other programs that are part of this effort include:

- Warmfront, which funds insulation and installation of efficient boilers in low-income English households. Funding was cut by more than two-thirds for 2011–12.
- The Community Energy Saving Programme (CESP), which obligates energy suppliers to promote a "whole house" approach to delivering energy efficiency in low-income areas. Although the program increased delivery in 2011 after a slow start, with one year left, it has only achieved 15 percent of its carbon-savings target.
- Additional programs implemented by the devolved administrations, including area-based schemes in Wales and Scotland and a voluntary energy supplier scheme in Northern Ireland (which is not covered by CERT or CESP given the devolved energy market).

Overall, the poor performance of insulation efforts shows that new policies must provide sufficient incentives to improve energy efficiency in the large proportion of the housing stock that currently lacks adequate insulation.

Nonresidential buildings

The main new policy covering the nonresidential sector is the Carbon Reduction Commitment (CRC). This covers large, non-energy-intensive companies and public sector organizations (ones with electricity consumption over 6,000 MWh), which together account for around 10 percent of UK GHG emissions. The CRC takes two principal approaches to reducing this sector's emissions:

- Participants will have to hold allowances to cover their emissions – the first sale of allowances to cover 2011–12 emissions will take place in 2012. Allowances will be available at a fixed price of £12/tCO_2 for 2012, raising around £1 billion.
- Mechanisms to enhance the reputation of companies and organizations that effectively reduce GHG emissions will further encourage them to develop energy management strategies. The first CRC performance league table, ranking participants in terms of their early action to manage their energy, was published in November 2011. Future league tables will be based on participants' efforts to improve their energy efficiency.

Concerns that the CRC will burden business have led the government to announce that it will seek to reduce administrative costs. If ways to do this cannot be found, the scheme will be replaced by an environmental tax.

In addition, two certificates attest to buildings' energy performance.

- Energy performance certificates (EPCs) are mandatory on rental or sale of all property (residential and commercial). These set out a building's theoretical energy performance. The commercial sector tends not to comply with this regulation; indicative data suggest that up to 70 percent of commercial properties are rented or sold without an EPC.

- Display energy certificates (DECs), which show a building's actual energy consumption, are mandatory for public buildings with a floor space over 1000m^2. To date, few private firms – for which DECs are voluntary – have taken them up. Perhaps because many buildings score poorly, these display certificates are frequently not displayed.

The latest data on the numbers of EPCs and DECs indicate that many buildings receive the lowest ratings (F and G) and thus have great potential for cost-effective abatement. Nearly 20 percent of nonresidential buildings receiving an EPC by mid-June 2012 earned one of the lowest energy ratings. This provides a case for the adoption of minimum standards.

Renewable heat

Renewable heat is targeted to increase from around 1% of heat supply currently to 12% by 2020. The need for financial support for this effort is recognized through the Renewable Heat Incentive (RHI), a "feed-in tariff" type scheme with funding paid per unit of heat generated.

- In a first phase, starting August 2011, tariff support has been targeted primarily at the nonresidential sector.

- Householders off the gas grid currently receive "premium tariffs" in return for which they will provide information on performance of particular technologies.

- Longer-term support for households is likely to be provided from summer 2013, with details currently under development.

- A mechanism for cost control is currently subject being developed to ensure that the policy remains affordable.

ROAD TRANSPORT

For the road transport sector, the prime sources of emission savings over the next few years will be increased use of biofuels and increased fuel efficiency of new cars and vans.

- To promote the use of biofuels:

  - The Renewable Transport Fuel Obligation (RTFO), which took effect in April 2008, requires fossil fuel suppliers to ensure that a specified percentage of their fuels for road transport in the UK – rising from 3.5 percent by volume in 2010–11 to 5 percent in 2013–14 – comes from renewable sources. Outturn in 2011 was 3.5 percent.

  - The EU Renewable Energy Directive (RED) sets both an overall renewable target and a binding UK target of 10 percent of energy from renewable sources in transport by 2020. The feasibility of reaching this transport-specific target while ensuring sustainability has been questioned in the UK by the Gallagher Review and the CCC Bioenergy Review.[19] It will be subject to review by the European Commission by the end of 2014.

- To increase the fuel efficiency of new cars:

  - EU legislation requires the reduction in average new car emissions across Europe to 130gCO_2/km in 2015 and 95gCO_2/km by 2020. The UK has made significant progress in recent years. New car emissions fell from 158.0gCO_2/km in 2008 to 149.5gCO_2/km in 2009,144.2gCO_2/km in 2010 and 138.1gCO_2/km in 2011. This reflects new more efficient models entering the market as well as some change in consumer behavior.

  - Significant scope for further improvement in efficiency remains, for example through consumers' buying "best in class" or through manufacturers' continuing to bring more efficient models to market.

  - It will be important to monitor consumption behavior to see if change observed during the recession persists as the economy recovers.

- To increase the fuel efficiency of new vans:

  - An EU framework – similar in approach to that for new cars – has been agreed to support emission

reduction from new vans. There will be a phased target to reduce emissions, with a target of 175gCO_2/km to apply for average emissions from all new vans across the EU in 2017, falling to 147gCO_2/km in 2020. In 2011 average new van emissions in the UK fell by 0.5 percent to 195gCO_2/km. It is not currently clear whether the UK will be able to reach the EU target.

Given the limits on the sustainable supply of biofuels and on the potential to improve conventional engine efficiency, carbon efficiency savings from the above measures are themselves limited. This suggests that in the long term, ultra-low carbon (electric or hydrogen) vehicles are key to the achievement of deep cuts in surface transport emissions. (The decarbonization of the power sector will clearly be crucial.) To allow deployment of electric vehicle technology in the 2020s, market development must start now. In this respect the government has made some progress.

- Funding for a plug-in car grant to support the purchase of electric cars was confirmed in 2010. The grant has been available from the start of 2011, offering up to £5,000 per car toward the up-front purchase cost of electric and plug-in hybrid cars. Take-up has been low to begin with, at least in part reflecting limited availability of such vehicles on the market, although more models are expected to be available soon. The grant has recently been expanded to vans – at amounts of up to £8,000 per vehicle.

- A "Plugged-in Places" program has been funded to support infrastructure (recharging network) investment in a number of pilot areas.

WASTE

Emissions from waste represent around 3 percent of UK emissions, primarily relating to landfill and wastewater handling. Emissions have fallen 64 percent since 1990, largely as a result of reduced methane emissions from landfill.

Key policy drivers have been:

- The EU Landfill Directive: this sets targets for reducing biodegradable waste to landfill and requires operators of landfill sites taking this waste to capture landfill gas and dispose of it by producing energy or flaring. The UK met its 2010 target under the directive to reduce biodegradable municipal waste to landfill to 75 percent of that produced in 1995.

- The landfill tax: introduced in 1996 at £7/tonne, the tax has increased to £56/tonne in 2011–12 and will rise by £8 each year to reach £80/tonne by 2014–15.

AGRICULTURE, FORESTRY, AND OTHER LAND USE

Agriculture emissions, primarily nitrous oxide and methane, account for around 9 percent of UK GHG emissions. Whereas in the energy sectors emissions fell significantly during the recession, this was not the case in agriculture. In the period since 1990, agriculture emissions have fallen 20 percent, from 63MtCO_2e to 50.7MtCO_2e in 2010. The government seeks to reduce agriculture emissions in England by 3MtCO_2e in 2020, which scales up to 4.5MtCO_2e for the UK as a whole.

There is some evidence that the intensity of emissions has dropped because of more efficient use of fertilizer. Methane emissions have also fallen since 2007, reflecting reductions in production and changes in composition of production (an increased share of white meat) and yields. Agriculture emissions in 2010, however, increased by 0.9 percent, against the long-term trend. The key driver was increased agricultural output, though there was a worsening emissions intensity of crop production, reflecting less efficient use of fertilizer.

There are substantial uncertainties over emissions factors and the potential for emission reduction. The government has commissioned several research projects to help develop UK emission factors. Current farming practice also must be better understood.

The current approach to reducing emissions in England by 3MtCO_2e annually by 2020 is industry-led and set out in an action plan[20] published in 2010. The level of ambition is low relative to the abatement potential identified by the CCC. The plan concentrates on more certain and cost-effective measures, such as deployment of anaerobic digestion systems and increased feed efficiency.

The plan includes several phases and uses a voluntary approach based on provision of information and encouragement. It is possible, however, that new policies will be needed – the Department for Environment, Food, and Rural Affairs (Defra) is committed to a policy review in 2012. The CCC has recommended that this review be broadened to consider the full range of abatement options. It also has indicated circumstances under which it would be appropriate to move from the voluntary approach to stronger incentives for action.

On a net basis, land use, land-use change, and forestry (LULUCF) absorbed 3.8MtCO_2e in 2010. There are significant uncertainties about current emissions, future trends, and the potential for permanent sequestration through land management. Woodland creation is being supported through a number of measures. More generally, the CCC has identified that a 10,000 hectare per year woodland creation program in the UK could deliver annual savings of 1MtCO_2e by 2030. An independent panel is providing further advice to the government on the future direction of forestry and woodland policy.

Agriculture and land-use policy is devolved within the UK. Each of the devolved administrations operates schemes to increase woodland creation rates and to inform farmers about agricultural efficiencies that reduce emissions.

Summary of progress

The latest data indicate that UK GHG emissions in 2011 are 28 percent below 1990 levels. Much of this decline can be attributed to the recession (emissions fell 9 percent in 2009); before the recession, emissions dropped less than 1 percent a year.[21]

There was a 7 percent decrease in GHG emissions in 2011. This was partly caused by reduced emissions from heat in buildings, reflecting mild winter weather in 2011 relative to very cold winter weather in 2010. Much of the remainder results from rising energy prices, falling real household income, and transitory changes in the power generation mix.

The main messages from the most recent (June 2012) CCC progress report have been that (1) although there has been some progress, the reduction in emissions in 2011 reflecting implementation of measures to reduce emissions is only around 0.8 percent; and (2) this rate of progress is only a quarter of that required to meet future carbon budgets.

Given new policies and a step change in the pace of emission reduction, the CCC analysis suggests that it is possible to outperform the currently legislated first, second, and third carbon budgets through domestic (i.e., UK, not "bought in") abatement, and that this is required to put the government on track to the tighter fourth carbon budget.

Policies under Development:

Electricity Market Reform (EMR)

CCC analysis has suggested a need for investment in 30–40GW of low-carbon generation capacity in the decade from 2020. Existing electricity market arrangements, however, are not considered sufficient to ensure progress toward cost-effective power-sector decarbonization.

The government has acknowledged the scale of the challenge – an estimated £110 billion of investment in electricity generation and transmission needed this decade alone. It has committed[22] to new market arrangements based on long-term contracts to help secure this investment. The government will retain overall accountability and set policy objectives for the electricity sector. A new delivery body will contract low-carbon generation through feed-in tariffs with contracts for difference (FiT CfD) and for capacity through a capacity market. There will be transitional arrangements for renewables under the existing renewable obligation, with ROC support closed to new generation from 2017.

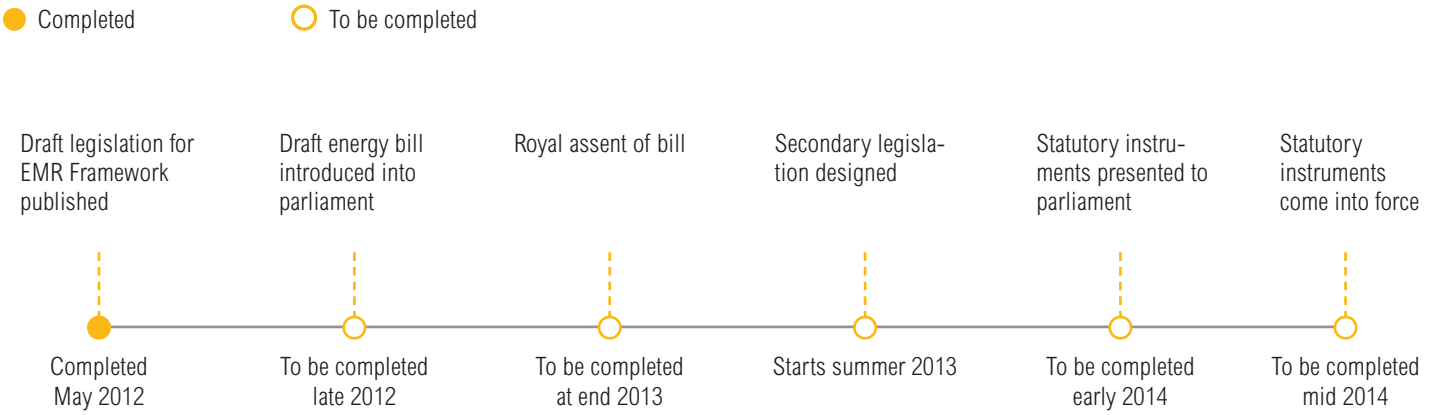
The purpose of the FiT CfD is to reduce risks to investment in low-carbon electricity generation. If the wholesale electricity price is below the agreed price in the contract, the generator receives a top-up payment to make up the difference. If the wholesale price is above the contract price, the generator pays the surplus back. Unlike current market arrangements, low-carbon generators would no longer be exposed to gas price risk.

The FiT CfD will be complemented by two mechanisms:

- A carbon price floor, to be introduced from April 2013, starting around £16/tCO_2 and rising to £30/tCO_2 in 2020. This is designed to provide greater certainty of the carbon price. It will be implemented through a charge on fossil fuel supplies to electricity generation, at a carbon price support rate set to reflect the differential between the market price of carbon in the EU ETS and the floor price.

- An emissions performance standard (EPS), which will provide a regulatory backstop on the amount of emissions new fossil fuel plants can emit. In March 2012, the government announced that the EPS will be set at a level equivalent to 450g/kWh at baseload, applying to new plants with grandfathering to future years. This would allow unabated gas-fired generation from new plants through to 2045.

Figure 5 | **Process for Implementing Electricity Market Reform**



If EMR, through contracts for difference and the carbon price underpin, brings forward low-carbon investments, then gas-fired generation could be limited to a balancing role. Under the announced EPS there is a risk, however, that gas-fired generation could play a greater role. This could result in average emissions from generation beyond levels implied by future carbon budgets.

Draft legislation for the EMR framework was published in May 2012 for prelegislative scrutiny. A draft energy bill is expected to be introduced into Parliament in late 2012, with Royal Assent likely toward the end of 2013. Consultation on secondary legislation will begin in 2013, with an expectation that statutory instruments would be laid before Parliament in early 2014 and come into force later that year.

This timetable for EMR envisages signing of the first FiT CfD contracts in 2014. At this stage, this seems achievable. The key questions and risks concern design issues (covered in part V).

Green Deal and Energy Company Obligation

The Energy Act 2011 provides for the development of a new approach to energy efficiency and carbon reduction through the "Green Deal" and the Energy Company Obligation (ECO).

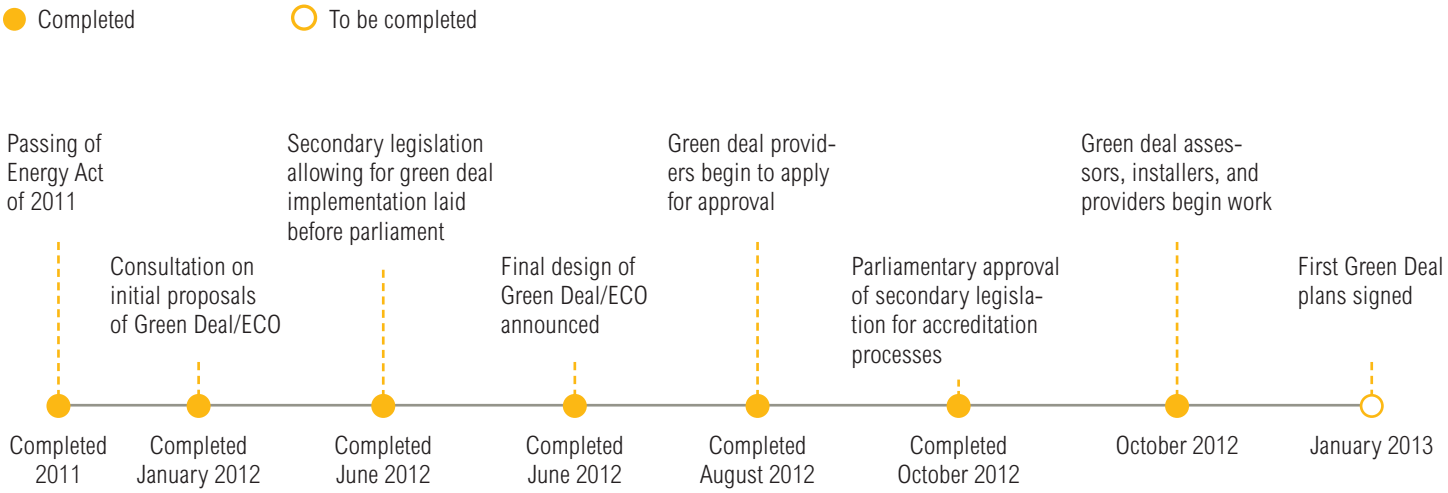
The Green Deal is the government's flagship energy efficiency policy. The intent is to provide private sector finance for investments in energy efficiency without upfront costs to the householder (or commercial property occupier) – the cost is charged to the property and repaid through the energy bill. Only measures that result in savings over and above the amount to be repaid (the "golden rule") are eligible for Green Deal finance, so the overall energy bill paid by the householder should be reduced. Loft and cavity wall insulation are expected to make up a high proportion of this cost-effective potential, but a wider range of measures are likely to be included in Green Deal packages.

Alongside the Green Deal, the ECO will require energy companies to deliver energy efficiency improvements for fuel-poor households and low-income areas. It will also subsidize high-cost measures (in particular, solid wall insulation and hard-to-treat cavity wall insulation) under the Green Deal (so that remaining costs meet the golden rule). The costs of the ECO will be passed on to all consumers through their energy bills.

The Green Deal/ECO design includes several innovative elements.

- Up-front financing for some measures
- Potential for a "whole house" approach, with the possibility for an energy audit to consider the needs of the property as a whole, and follow-up with a comprehensive package of measures
- Accreditation, with energy advisers and installers required to be certified and display a quality mark in order to build consumer confidence
- Minimum energy efficiency standards introduced in 2018 in the private rented sector

Figure 6 | **Process for Implementing Green Deal / ECO**



- Nevertheless, consultation on initial proposals raised substantial concerns that they would not deliver on the scale necessary for meeting future carbon budgets. It was unclear that the Green Deal's market-based approach would be sufficient to overcome the substantial nonfinancial barriers to energy efficiency uptake. The government's own impact assessment suggested that levels of uptake would be low.

Final design for the Green Deal and ECO was announced by the government in June 2012. This design makes some significant changes that should result in more cavity walls and lofts being insulated than under the original proposals. The government's assessment is that by 2022 the new policies could result in the installation of insulation in close to 1 million solid-wall houses, 2.7m cavity walls, and 1.6 million lofts, resulting in savings of 1.8MtCO_2 a year.

While this is an improvement on initial proposals, considerable uncertainty over the likely uptake of measures remains. The CCC's assessment is that the estimated installation numbers for cavity walls and lofts remain low, with a gap of at least 3MtCO_2 against its indicator trajectories.

The Green Deal and ECO were launched in October 2012. The key provisions allowing for Green Deal financing through a charge on energy bills (thereby avoiding the need for consumers to pay upfront costs) and enabling an ECO to be set are part of the Energy Act of 2011. Secondary legislation was laid before Parliament in June 2012. Upon parliamentary approval in August 2012, accreditation processes to register assessors and installers recently began; Green Deal providers similarly began to apply for approval around this time. Assessors, installers, and providers have now begun work, with the first Green Deal plans to be signed in January 2013.

IV: GHG PROJECTIONS

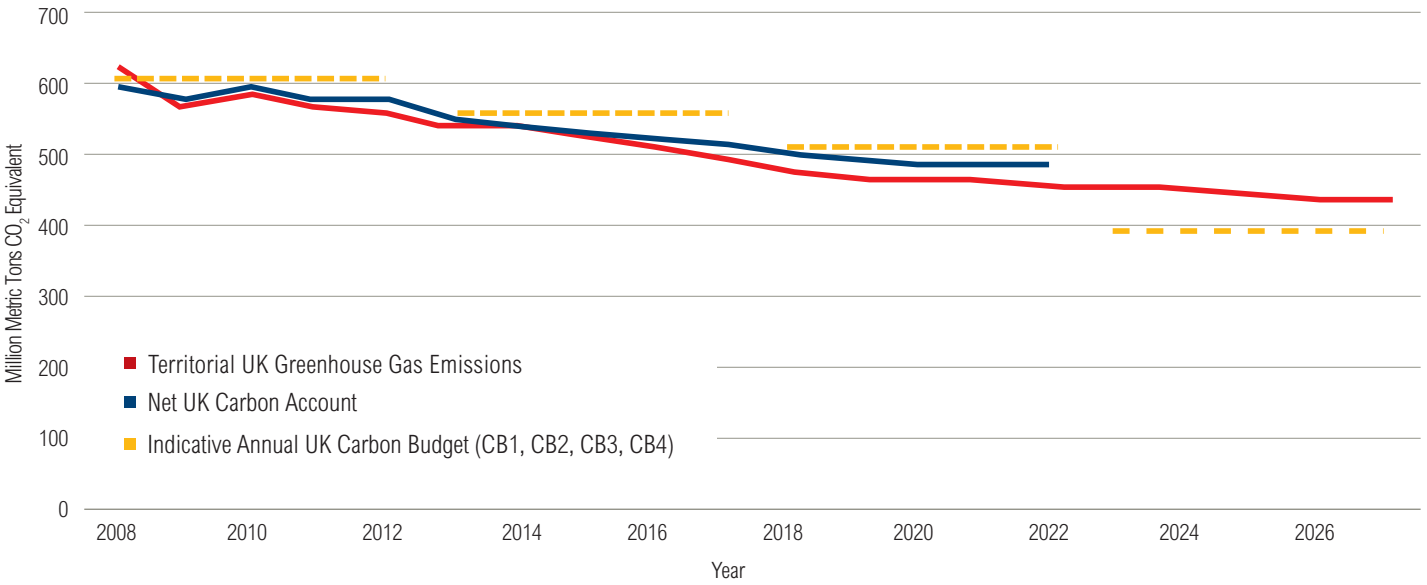
This section provides an overview of the expected national GHG emissions trajectory, allowing for current policies and measures.

The Department of Energy and Climate Change (DECC) produces regular projections of energy demand, supply, and GHG emissions. This report is based on the projections[23] (Figure 5) published in October 2011.

This emission projection from DECC is reported on both a net UK carbon account basis[24] and a territorial basis. These are further split into the GHG emissions covered by the EU ETS ("traded" emissions) and those outside the EU ETS ("nontraded" emissions).

Coverage reflects the basket of Kyoto gases. CO_2 emissions are projected using the DECC Energy and Emissions Model; non-CO_2 emissions are from separate models;[25] LULUCF emissions are estimated separately[26] under contract to the DECC using a methodology consistent with the UK Greenhouse Gas Inventory. The models require key input assumptions, set out in DECC 2011d. These assumptions

Figure 7 | **Projected UK GHG Emissions**



are generally based on other UK Government publications (e.g., fossil fuel prices from other work by DECC; household and population numbers from the Office of National Statistics [ONS]), or – in the case of economic growth – assumptions from the Office of Budget Responsibility (OBR), which was established in 2010 to provide independent analysis of the UK's public finances.

The projections take into account climate change policies where funding has been agreed to and where decisions on policy design are, in the view of DECC, "sufficiently advanced to allow robust estimates of policy impacts to be made."[27] For the October 2011 projections this has several methodological implications:

- Expected impacts from the Green Deal/ECO (one of the measures reported above as under development in "Overview of Major Policies") have been included.
- The impact of electricity market reform (EMR) is not explicitly included. This reflects the fact that the level of decarbonization of the electricity sector to be delivered by EMR has not been set. Nevertheless, the modeling implicitly assumes that decarbonization proceeds.
- Additional measures that may be required to meet the fourth carbon budget (2023–27), but which are not yet specified, are excluded.

The latest projection on a National Communications (NC) basis (i.e., the basis for reporting under the UNFCCC) is shown below (Table 4).

The government projections suggest that the UK will meet its first three carbon budgets. The projection beyond 2022 represents a no-additional-policy baseline (i.e., no policy beyond that to which the government is currently committed). This indicates that further measures will be required to meet the fourth carbon budget (2023–27) (Table 5).

Projections of GHG emissions are, of course, subject to considerable uncertainty. DECC 2011d acknowledges this limitation and examines the uncertainty attached to possible variation in some of the key input assumptions (e.g., fuel prices, GDP growth). This leads the DECC to conclude that the "likelihood that the UK will fail to meet carbon budgets targets in the first three carbon budget periods is low."

There is also uncertainty around how emissions will respond as the economy returns to growth after the impact of a major recession. It is possible that some of the behavior change observed during the recession will prove temporary and that emissions could "bounce back" by more than otherwise expected. There is little evidence on this point, and this is an issue that will need to be monitored.

Table 4 | **Government Emissions Projections**

YEAR	1990	2010	2015	2020	2025	2030
UK net carbon account						
$MtCO_2e$	782	593	531	486		
Change since 1990 (%)		-24	-32	-38		
UK greenhouse gases						
$MtCO_2e$	782	586	524	463	442	418
Change since 1990 (%)		-25	-33	-41	-43	-47

Source: Updated Energy and Emissions Projections 2011, DECC, October 2011

Emission projections are available from other sources, in particular, Cambridge Econometrics (CE), which regularly publishes projections. The CE model has been used by the CCC to draw comparisons with the DECC projections (CE 2011).

The CE projections of GHG emissions tend to be higher than those calculated by the government, suggesting, for example, that emissions are not on track to meet carbon budgets – by a narrow margin for the first two carbon budgets, and with a widening gap for carbon budgets 3 and 4. This partly reflects the approach to inclusion of policy impacts, with CE applying stricter criteria before estimated policy impacts are included.

In broad terms, CCC analysis confirms that the UK could outperform the third carbon budget.[29] The basis of the CCC approach is, however, rather different, and it contains reservations about the basis of the DECC projections.

The CCC starts with a reference projection (from the DECC Energy Model). It then nets from this its estimates of abatement potential that should be addressed, either because it is cost-effective (in the budget period) or because it is associated with developing options required for the future (i.e. options needed and cost-effective in the longer-term). To secure these emission savings, however, these measures must be implemented and delivered at a rate faster than past performance. If this happens, and allowing for impacts of the recession, this could put the UK on track to outperform the third budget.

The October 2011 DECC projections incorporate the impact, following internal review, of a number of methodological changes – both to the method for projecting sectoral growth and to the equations used to project demand in the residential, transport, iron and steel and commercial sectors. The DECC has also taken steps to improve the transparency of the assumptions and drivers of changes between projections.

These refinements to the model give greater confidence in its results, and in the potential for 2020 emissions to fall below the level of the third carbon budget. The fundamental point remains, however, that this will require strong and timely implementation of the measures to which the government has indicated its commitment. The government projections include significant GHG emission savings from policies, including the Green Deal/ECO, that are not currently fully implemented and for which savings at the level suggested is uncertain. In order to be on track to meet the tighter fourth budget it also appears necessary that emissions in the third budget period will have to be significantly below the legislated level.

Table 5 | **GHG Emission Projections ($MtCO_2e$) by Carbon Budget Period**

CARBON BUDGET PERIOD	2008–12	2013–17	2018–22	2023–27
Traded sector	1,189	1,033	849	766
Non-traded	1,689	1,571	1,472	1,441
Territorial emissions	**2,877**	**2,604**	**2,322**	**2,207**
Traded Sector Cap	1,233	1,078	985	n.a.
European Union allowances (EUAs) purchased (+) / sold (-)	-44	-46	-136	n.a.
Net carbon account	2,922	2,650	2,457	n.a.
Level of budget	3,018	2,782	2,544	1,950
Difference from budget (-ve indicates emissions under budget[28]; +ve indicates emissions above budget)	-96	-132	-87	257
Uncertainty range in projected overachievement (high- to low- emissions projection)	-73 to - 124	-73 to -172	-19 to -142	n.a.

Source: Updated Energy and Emissions Projections 2011, DECC, October 2011.

V: LOOKING AHEAD

Policies

Key questions over the next year will concern development of the policies outlined above in "Overview of Major Policies":

- Will the EMR be developed to give greater confidence in the scale of emission reduction expected from the power sector over the period to 2030? It will be particularly important to create a market environment with a risk/return balance that attracts low-carbon investment. In the absence of sufficient low-carbon investment, the announced emissions performance standard allows for a possible requirement for new gas generation to maintain security of supply. Such investment, operating at baseload, would be incompatible with future carbon budgets. Setting a clear decarbonization objective would help resolve some of the uncertainties that currently undermine the investment climate for low-carbon power.
- Will the Green Deal/ECO be developed to secure levels of emissions saving from insulation measures previously identified as cost-effective, as well as beginning the move toward more difficult measures? We have suggested some ways to further strengthen incentives.
- Will the Renewable Heat Incentive be attractive enough to result in a substantial scaling up of renewable heat deployment?

Without policy strengthening in these areas, delivery of future carbon budgets is more likely to be called into question.

Politics

There is currently much debate in the UK about rising household energy bills, and the extent to which this is or will result from the costs of financing low-carbon investments. Claims have been reported in the press, including from some think tanks and climate commentators, that recent energy

bill increases are caused by environmental policy costs, and that further dramatic bill increases will follow over the next decade, driven by low-carbon investments.

Analysis published by the CCC[30] has found that the average dual-fuel energy bill for a typical household would increase from around £605 in 2004 to £1,060 in 2010. Over 80 percent of this increase, however, was unrelated to low-carbon measures – most reflects increased wholesale gas costs. Over the next decade we can expect a rise of around £100 in the average bill as a result of investment in low-carbon power capacity. However, if new policies to stimulate energy efficiency (such as a strengthened Green Deal/ECO) are introduced, bills in 2020 could be contained at current levels.

Unsurprisingly, at a time of slow economic growth with household finances under strain, the impact of climate policies on energy prices and bills remains highly sensitive. This points to a continuing need for the government to dispel myths and be clear about the expected scale of impacts, and to pursue strong energy efficiency policies to reduce bill impacts even where unit prices may increase, with a priority given to the protection of vulnerable households.

Beyond this, the government will have a chance to demonstrate its commitment during the review of the fourth carbon budget. In accepting the advice of the CCC and legislating for a tight budget (requiring a 50% reduction in emissions in 2025 on 1990 levels), the government indicated that it would review the budget in 2014. This reflects anxiety about the implications of domestic climate policies for the competitiveness of UK industry. It will be important to consider these costs objectively and – where significant – to consider potential policy measures to ameliorate the impact. The government has left open the possibility that if the EU has not tightened the EU ETS cap, and if the UK government considers the domestic commitment would otherwise place the UK on a different emissions trajectory than the one agreed to by the EU – it may revise upward (loosen) the budget.

Before completing its review, the government will seek the advice of the CCC. The outcome of this review is likely to be crucial for confidence in the UK's trajectory toward meeting its long-term goal of an 80 percent emission reduction by 2050.

ABBREVIATIONS AND ACRONYMS

CCA	climate change agreement
CCC	Committee on Climate Change
CCS	carbon capture and storage
CCTF	Climate Change Task Force
CE	Cambridge Econometrics
CERT	Carbon Emission Reduction Target
CESP	Community Energy Saving Programme
CLG	Department for Communities and Local Government
CRC	Carbon Reduction Commitment
DEC	display energy certificate
DECC	UK Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
ECO	Energy Company Obligation
EMR	electricity market reform
EPC	energy performance certificate
EPR	European pressurized reactor
EPS	emissions performance standard
ETS	Emissions Trading System
EU	European Union
EUA	European Union allowance
FiT CfD	feed-in tariffs with contracts for difference
GHG	greenhouse gas
HFC	hydrofluorocarbon
IPCC	Intergovernmental Panel on Climate Change
LULUCF	land use, land-use change, and forestry
mtoe	million tonnes of oil equivalent
NC	National Communication
OBR	UK Office of Budget Responsibility
OCN	Open Climate Network
Ofgem	Office of Gas and Electricity Markets
ONS	UK Office for National Statistics
PFC	perfluorocarbon
RED	Renewable Energy Directive
RHI	Renewable Heat Incentive
ROC	renewable obligation certificate
RTFO	Renewable Transport Fuel Obligation
UNFCCC	United Nations Framework Convention on Climate Change

ENDNOTES

1. DECC 2011d.
2. Figures reported in the text include GHG emissions from the land use, land-use change, and forestry (LULUCF) sector unless otherwise specified.
3. GHG emissions intensity = total GHG emissions/total gross domestic product, PPP ($Intl).
4. In purchasing power parity terms using constant 2005 international dollars.
5. The target covers the Kyoto basket of emissions – carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6). It covers all sectors, excluding international shipping and LULUCF.
6. This target also represents a 9 percent reduction from the reference case. This reference case is taken from latest government projections; it is not a "without all measures" reference – it includes policies from before the 2009 Low Carbon Transition Plan.
7. DECC 2011e.
8. Supporting analysis on this point is set out in CCC 2008 and CCC 2010.
9. DECC 2011a.
10. DECC 2011a.
11. Ibid.
12. CCC 2012b.
13. DECC 2011e.
14. See http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/climatechangeact/targets.
15. CCC 2011b, 2011c, 2012a.
16. CCC 2011a, CCC 2012d.
17. DECC 2012.
18. Inclusive of power sector emissions attributable to use by industry.
19. CCC 2011e.
20. CCTF 2010.
21. CCC 2012d. Annual reductions of close to 3 percent are required to meet the fourth carbon budget.
22. DECC 2011b.
23. DECC 2011d. New projections were released in October 2012, too late to be included in this report.
24. That is, the sum of the traded sector cap and the actual level of nontraded emissions. The difference as against territorial emissions reflects net purchase or sales of carbon units (emissions allowances in the EU ETS and project credits).
25. DECC 2011c.
26. By the Centre for Ecology and Hydrology.
27. A detailed table of assumed emission savings by policy measure is included in Annex G of DECC 2011d.
28. Difference from budget is reported on a net carbon account basis for carbon budgets 1–3, but on a territorial emissions basis for the fourth carbon budget. This reflects the fact that the UK share of the EUETS cap in the fourth carbon budget period is not known.
29. CCC 2011a.
30. CCC 2011d.

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ABOUT WRI

WRI focuses on the intersection of the environment and socio-economic development. We go beyond research to put ideas into action, working globally with governments, business, and civil society to build transformative solutions that protect the earth and improve people's lives.

ABOUT THE CCC

The Committee on Climate Change (CCC) is an independent body established under the UK Climate Change Act (2008). It advises the UK Government on setting and meeting carbon budgets – 5-yearly caps on the total quantity of UK GHG emissions, currently in legislation out to 2027 – and on preparing for the impacts of climate change. It provides an annual report to Parliament on progress towards meeting those budgets.

ABOUT THE OPEN CLIMATE NETWORK

The Open Climate Network brings together independent research institutes and stakeholder groups to monitor countries' progress on climate change. We seek to accelerate the transition to a low-emission, climate-resilient future by providing consistent, credible information that enhances accountability both between and within countries. http://www.openclimatenetwork.org.