Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013-2027

The Draft Second Report on Proposals and Policies
Ministerial Foreword

In 2009, the Scottish Parliament unanimously passed the most ambitious climate change legislation anywhere in the world.

Whilst there is an increasing global focus to deal with the economic downturn, that in no way diminishes the clear threat that climate change poses to the people of Scotland and our quality of life, if average global temperature rises cannot be kept to 2 degrees Celsius.

Acting both locally and globally to reduce greenhouse gas emissions, by moving to a low carbon economy, it is vital to address the very real economic and social impacts of climate change on present and future generations.

Investing in a low carbon economy also supports sustainable growth in Scotland by helping households and businesses save money through energy and resource efficiency and by securing new jobs and investment.

Recognising the importance of this, the Scottish Government has made our transition to a low carbon economy one of our strategic priorities in our Government Economic Strategy.

Scotland has made good progress on the transition, despite limitations on the powers held by the Scottish Parliament. By 2010, our greenhouse gas emissions were down by 24.3% since 1990 and already more than halfway towards our 2020 target of reducing greenhouse gas emissions by 42%. By way of comparison, we had reduced emissions faster than any member state in the EU-15.

This is the draft of our second report on proposals and policies for meeting Scotland’s emissions reduction targets and builds on the package of measures set out in the first report, while extending the timeframe to cover targets for 2023-2027. This draft will be considered by the Scottish Parliament for a 60-day period, after which we will publish a final version.

The challenge that we have set ourselves is not an easy one. It would have been far easier to set targets that ignored climate science or showed little ambition, so that they would be straightforward to meet. Scotland does not lack ambition and as a nation we can take pride in that.

Of course, this challenge is even greater due to: the inability to achieve an EU-wide consensus on a 30% emission reduction by 2020; the historical emissions data is constantly under revision and since the targets for this report were set the data has been revised upwards making it more difficult to hit our targets; and the sheer difficulties of looking forward a decade and
half and thinking about the technologies that will be available and how they will shape life in Scotland in 2027 have all added to the challenge of meeting our targets. However, this challenge of meeting our ambitious targets is one to which this Scottish Government is determined to rise.

The package of proposals and policies outlined in this report has the capacity to deliver emissions cuts well in excess of the amount that the independent expert Committee on Climate Change suggested was possible. Their July 2011 advice on setting the annual targets for 2023-2027 was based on its assessment of what was a reasonable global contribution for Scotland given our potential and on the assumption that a 30%EU wide target was adopted.

As we move through the next decade and beyond we need to intensify our efforts in: improving energy efficiency of buildings; supporting the uptake of low carbon vehicles; investing in improving public transport and supporting sustainable and active travel; reducing the waste we produce and being smarter about what we do with it. We also need to make the most of the opportunities afforded by good stewardship of Scotland’s ecosystems, deploying best practice in agriculture, while improving the ability of our peatland and woodland to lock in carbon.

We are already laying the foundations for much greater, long term, transformational changes in the way we generate and use energy, with decarbonisation of electricity generation being a key driver of our progress towards a low carbon economy.

Scotland can be justifiably proud of the progress being made to exploit our competitive advantage in terms of our renewables resources to diversify our energy supply, create jobs and improve energy security. However, we can go further and that is why we have set ambitious new targets specifically to decarbonise the production of electricity and heat. By 2011, renewables capacity generated 36.1% of Scotland’s electricity needs – smashing our 31%interim target years ahead of schedule - and putting Scotland on track to produce equivalent to 100% of electricity demand by 2020 from renewable sources.

Hence, the low carbon transition is well underway, but we are in the early stages of our journey. We must maintain momentum if we are to avoid facing the increased costs that could arise later if the global community fails to act. To achieve this, we need the continued support of our partners in the private and public sectors, the involvement of activists within the environmental NGO movement and, most importantly, the participation of individuals and families across Scotland.
We recognise the responsibility of the Scottish Government to lead this effort: to help households and businesses save money on their bills; to make the big choices on policy and secure the investment that will give Scotland a competitive advantage in important industries and markets; and, ultimately, to ensure we seize the opportunities that a low carbon future offers both to Scotland's economy and society as a whole.

Richard Lochhead
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Paul Wheelhouse
Minister for Environment and Climate Change
Table of Contents

EXECUTIVE SUMMARY .............................................................................................................. 3

1. LOW CARBON SCOTLAND ........................................................................................................ 6
   1.1 LOW CARBON SCOTLAND IS A BETTER SCOTLAND ............................................................. 6
   1.2 SCOTLAND’S PLACE IN THE WORLD ............................................................................... 8
   1.3 HOW SCOTLAND COMPARES TO OTHER COUNTRIES .................................................. 12
   1.4 LIMITED POWERS ............................................................................................................ 14
   1.5 LOW CARBON SCOTLAND – OUR VISION ...................................................................... 15
   1.6 CLIMATE CHANGE ADAPTATION .................................................................................... 16

2. BACKGROUND AND CONTEXT ............................................................................................. 18
   2.1 A WHOLE GOVERNMENT APPROACH .......................................................................... 18
   2.2 OUR GUIDING PRINCIPLES .......................................................................................... 18
   2.3 THE CLIMATE CHANGE (SCOTLAND) ACT 2009 – STATUTORY DUTIES ............... 20
   2.4 THE GREENHOUSE GAS EMISSION REDUCTION TARGETS 2013–2027 .................. 22
   2.5 ESTIMATING EMISSIONS REDUCTIONS: BUSINESS-AS-USUAL PROFILE .............. 23
   2.6 THE COMMITTEE ON CLIMATE CHANGE TARGET ADVICE ................................ 25
   2.7 EXPLAINING THE TRADED AND NON-TRADED SECTORS .................................... 27
   2.8 THE EMISSIONS ABATEMENT TRAJECTORY ................................................................. 29
   2.9 THE DOMESTIC EFFORT TARGET .................................................................................. 31
   2.10 THE 2010 GREENHOUSE GAS EMISSION REDUCTION TARGET ........................... 31
   2.11 DEFINITIONS: POLICIES, PROPOSALS AND ENABLING MEASURES ..................... 33
   2.12 HOW WE DEAL WITH COSTS AND BENEFITS ......................................................... 34
   2.13 CONSUMPTION-BASED EMISSIONS .......................................................................... 35
   2.14 WORKING WITH OUR PARTNERS ................................................................................. 36
   2.15 HOW WE GOT HERE – TIMELINE SUMMARY ............................................................ 38

3. UNDERSTANDING AND ACHIEVING TRANSFORMATION .................................................. 39
   3.1 FIVE CROSS CUTTING THEMES OF TRANSFORMATION .............................................. 39
   3.2 STRATEGIC ASSESSMENT: UNDERSTANDING EXTERNAL DRIVERS .................. 39
   3.3 THE TRANSITION TO A LOW CARBON ECONOMY ..................................................... 42
   3.4 FUNDING AND FINANCING THE CLIMATE CHANGE TARGETS ............................ 46
   3.5 UNDERSTANDING AND INFLUENCING BEHAVIOUR ............................................. 56
   3.6 THE ROLE OF THE PLANNING SYSTEM ..................................................................... 66

4. ENERGY ..................................................................................................................................... 68
   4.1 OUR AMBITIONS FOR DECARBONISING SCOTLAND’S ENERGY SUPPLY ............. 68
   4.2 OUR AMBITIONS FOR DECARBONISING SCOTLAND’S ELECTRICITY SUPPLY ...... 69
   4.3 WHERE WE ARE NOW .................................................................................................... 71
   4.4 DECARBONISATION POLICIES - OUR APPROACH ..................................................... 76
   4.5 ENERGY DEMAND REDUCTION ..................................................................................... 79
   4.6 THE ROLE OF RENEWABLE ELECTRICITY ................................................................. 80
   4.7 THE ROLE OF CARBON CAPTURE AND STORAGE ..................................................... 83
   4.8 OIL AND GAS .................................................................................................................. 83
   4.9 GRID INFRASTRUCTURE AND CONSENTS FOR RENEWABLE GENERATION .......... 84
   4.10 ENERGY MARKET – POWERS AND REGULATION .................................................... 85
   4.11 COSTS AND BENEFITS OF A LOW CARBON ENERGY MIX .................................... 86

5. HOMES AND COMMUNITIES .................................................................................................. 89
   5.2 OUR AMBITION FOR HOMES AND COMMUNITIES .................................................... 89
   5.3 WHERE WE ARE NOW ..................................................................................................... 89
Executive Summary

This report is a draft of the Scottish Government’s second report on proposals and policies (RPP2) for meeting its climate change targets. Specifically, it sets out how Scotland can deliver its statutory annual targets for reductions in greenhouse gas emissions for the period 2013-2027.

It is set in the context of Scotland’s role in leading the way to a low carbon society. By 2010, Scotland’s emissions, including international shipping and aviation, had fallen 24.3% from 1990, over half way to meeting the 42% 2020 target set in the Climate Change (Scotland) Act 2009.

While meeting the strict targets we have set for ourselves remain a challenge, Scotland has been making good progress when compared with EU countries. Scotland’s emissions have reduced more than any of the EU-15 since 1990 and our reductions have been greater than the average for the EU-27 Member States, which was 14.3%. On a comparable basis which is not adjusted for emissions trading, Scotland’s emissions fell by 22.8%.

The report explains our further ambitions for a low carbon Scotland, in a lower carbon world economy, and why Scotland is so well placed to make this transition. We believe that the transition is an essential investment for the people of Scotland, our environment, and future generations and is an important contribution that Scotland can make to a global challenge.

The report describes the legislative context that we are operating within, the role of our independent advisor the Committee on Climate Change, the importance of EU climate change policy, the context of international climate change negotiations, a summary of how we estimate emission abatement and sequestration, and our approach to costs and benefits. It draws attention to our most important partners, and lays out the principles that are guiding our approach.

It outlines the major cross-sectoral areas that we need to focus on to achieve our ambitions: considering potential different futures that might come to pass; making the transition to a low carbon economy; getting our funding and financing mechanisms right; understanding and influencing behaviours; and the critical role of our spatial planning system.

The draft report is structured around a number of sectoral chapters that focus on areas with major emissions and or sequestration implications: energy supply with a focus on electricity generation; homes and
communities; business, industry and the public sector; transport; waste and resource efficiency; and rural land use.

Each sectoral chapter highlights: our ambition for reducing the emissions intensity of the sector; a summary of where we are now; policies and proposals for delivering emissions abatement; supporting and enabling measures; costs and benefits; highlights of progress to date and a high-level summary of sectoral emissions abatement potential.

- **Energy** emissions, largely from electricity generation, are addressed through our target to decarbonise electricity, which will be achieved through a combination of: energy efficiency measures, renewable energy, and carbon capture and storage.

- **Homes and communities** emissions are addressed through fabric improvement and heating efficiency, building standards, the decarbonisation of heat, and information measures such as smart meters.

- **Business, industry and public sector** emissions are addressed through energy and resource efficiency measures, the decarbonisation of electricity, and the decarbonisation of heat.

- **Transport** emissions are addressed through four packages: decarbonising vehicles, road network efficiencies, sustainable communities including modal shift to walking, cycling and public transport, and business engagement around sustainable transport.

- **Waste and resource efficiency** emissions are addressed through the reduction of landfill gas (Zero Waste Plan).

- **Rural land use** emissions and sequestration are addressed through a combination of improved agricultural practice, woodland creation and management, and peatland restoration.

The measures in this report create costs and benefits for government, business and private households. We estimate the costs of implementing these measures to be on average £1.6 billion per annum (or 1% of GDP) while the average benefits are estimated to amount to £1.2 billion (in 2011 prices) per annum.

The influential Stern report on the economics of climate change estimated that the cost of a changed climate could be from 5% to 20% of global GDP (from declining agricultural production, heat-waves, droughts, flooding events, etc.) and that stabilising greenhouse gases to avoid a global temperature increase in excess of 2°C by 2050 would cost the global community roughly 2% of GDP by 2050.
The estimates in this report do not include transformational investments in the electricity generation sector. In addition there are some proposals for which cost estimates are not available at this stage. The benefits cited are solely calculated on the basis of potential fuel and energy savings and do not include additional benefits in terms of, for example, improved air quality or biodiversity conservation.

The final chapter outlines our plans for monitoring and delivery, led by the Scottish Government’s Emission Reduction Programme Board. Annex A contains more detailed information on emissions sector by sector. Annex B gives information on the extent to which our annual targets are met. Further information can be found in the Technical Annex published alongside this report.
1. **Low Carbon Scotland**

1.1 **Low carbon Scotland is a better Scotland**

1.1.1 The purpose of the Scottish Government is to focus Government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable growth. Making the transition to a low carbon Scotland, through the achievement of our ambitious climate change targets, will place Scotland in an advantageous position within the global economy. Importantly, we will support global efforts to prevent the damaging effects of climate change and, in doing so, provide numerous benefits to communities and businesses across Scotland.

1.1.2 The urgency to reduce greenhouse gas emissions globally is accelerating. Despite increasing awareness and political acceptance of the problem, carbon dioxide (CO₂) emissions and, consequently, CO₂ concentrations continue to rise (390 parts per million in 2011 compared to 278 parts per million in 1750). Higher greenhouse gas concentrations in the atmosphere mean global temperature has increased and is now about 0.8 °C above pre-industrial levels.

1.1.3 The World Bank reported in 2012 that present emission trends put the world plausibly on a path toward 4°C warming within the century. This could lead to a sea-level rise of 0.5 to 1.0 metre (possibly more); an increase of about 150 % in acidity of the ocean, making climate change the greatest threat to biodiversity (surpassing the threat of outright habitat destruction); and increase extremes of rainfall and drought that, apart from their direct costs, could substantially undermine food security globally and lead to mass movements of population seeking access to secure supplies of water and/or food.

1.1.4 The longer action is delayed, the higher annual emission reductions need to be thereafter in order to keep CO₂ concentrations in the atmosphere below a dangerous level (such as the 800 ppm by 2100 used in the World Bank analysis).

1.1.5 While climate change is seen as one of the greatest global threats we face, and will undoubtedly impact upon quality of life and economic performance in Scotland too, and is recognised as a national security threat,

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1 Information on our purpose targets and performance indicators, including those relating to sustainability, can be found at [http://www.scotland.gov.uk/About/Performance/scotPerforms/glanceperformance](http://www.scotland.gov.uk/About/Performance/scotPerforms/glanceperformance)

addressing it is also one of our greatest opportunities – for our economy, our environment, and the wellbeing of our people. That is why we have put tackling climate change at the heart of our ambition for the people of Scotland.

1.1.6 A low carbon Scotland will capitalise on natural resources and the talents and skills of our people. It will make better use of our precious natural resources both at home and abroad. It will reduce the amount of energy people need to use in their homes, schools, workplaces, and public buildings, and in doing so help to reduce levels of fuel poverty. It will improve our public spaces and, therefore, improve public health: by reducing traffic pollution and increasing active travel as well as increasing woodland cover, particularly in and around urban areas. And, importantly, it will benefit our biodiversity, through tree planting and peatland restoration through increasingly sustainable land use.

1.1.7 A low carbon Scotland will also provide us with greater resilience to volatile energy and commodity prices. It will reduce our dependence on fossil fuels subject to geo-political forces outside our control. Simply put, a low carbon Scotland is a better Scotland. We regard it as an investment for our people, our environment, and essential for the benefit of future generations.

1.1.8 However, making the transition will not always be straightforward and there remain areas of uncertainty as we look further into the future. Some aspects will be challenging as we embrace new ways of doing things and work with new, more sustainable technologies.

1.1.9 Some measures will be more successful than anticipated while others may not go to plan. Some emerging technologies may or may not succeed in penetrating markets, and people may act in unexpected or irrational ways in terms of consumer behaviour. There may be unintended consequences – some positive, some less so. Business models will change, and new financial and investment instruments will come to market. Global drivers, for example financial systems and energy markets, will have impacts that at this time we cannot predict.

1.1.10 Our approach to the transition takes account, as best as can be achieved, of these uncertainties and challenges. It maximises opportunities but does not shy away from risks or uncertainties. We do not pretend there is one firm route or detailed plan for meeting all the annual targets and making the transition in the long term. That would not be appropriate for targets that reach out over such a long time horizon.
1.1.11 Rather, this document explains how we can collectively achieve Scotland’s targets, building in flexibility along the way. In some cases, for example with our ambitions to decarbonise heat, we set abatement goals without yet having completely finalised set of measures for getting there. Where we do this we state when the detailed approaches will be published – but that doesn’t mean we do nothing while the new proposal is being developed. We are continuing to put in place policies and drive forward projects that transform our approach to energy, resource, and land use over time. This means that we have more detail and firmer commitment in the early years, with less detail for the later targets.

1.1.12 Our monitoring framework and the preparation for RPP3 (which will follow Parliamentary approval of the next set of targets for 2028–2032 in 2016) will give us opportunities to continually review progress and change tack as required. We believe that this approach is the most practical way of meeting our annual climate change targets out to 2027 and beyond.

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**Laying the foundations**

We are already laying the foundations for low carbon transformation across sectors of the economy and society. Scotland’s emissions have fallen 24.3% from 1990 levels. We are, therefore, more than halfway towards achieving our Climate Change (Scotland) Act target of at least 42% emission reduction by 2020.

Our ambitions for renewable electricity are also paying off. In 2011 renewable sources produced almost 14 GWh of electricity in Scotland, equivalent to some 36.3% of Scotland’s total electricity consumption, well on the way to our new 2015 target: 50% of Scotland’s electricity demand to be met by renewable sources. We know that renewable capacity increased by 15.2% between 2011 and 2012 indicating the excellent progress that continues to be made.

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**1.2 Scotland’s place in the world**

1.2.1 Current global pledges for emissions cuts are not enough to limit global warming to 2 °C so raising worldwide ambition remains a high priority for the Scottish Government. Scotland aims to be a model for the international community in tackling climate change. Our ambitious statutory domestic climate change targets, with a requirement to meet annual targets, remains highly unusual. We are playing a full part in supporting UK efforts

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³ This figure has been adjusted for trading in the EU ETS. Unadjusted emissions have fallen by 23% since 1990.
on climate change by demonstrating to the international community the growth, investment and job opportunities of the low carbon economy, and championing climate justice.

1.2.2 At the UN Framework Convention on Climate Change (UNFCCC) summit in Doha in December 2012, the EU and some other countries agreed to a second commitment period to the Kyoto Protocol to run for eight years from 2013 to 2020. For this second period, the EU has taken on an emissions reduction commitment in line with its domestic target of cutting emissions by 20% of 1990 levels by 2020, but has left the door open to stepping up this reduction to 30% if the conditions are right.

1.2.3 The targets of all countries participating in the second period will be revisited by 2014 with a view to considering raising ambition. However, the countries taking part in the second Kyoto period account for only around 14% of world emissions and by 2020 this will have fallen to around 10% This underscores the need for the future climate regime to involve action by all countries. The second period forms part of the transition to the global agreement taking effect in 2020.

The world is getting warmer

The decade 2001-2010 was the warmest since records began in 1850, with global land and sea surface temperatures estimated at 0.46 °C above the long-term average (1961-1990) of 14.0 °C. Nine of these years were among the ten warmest on record. 2012 is currently ranked the 9th warmest year on record.

2013 is expected to be between 0.43°C and 0.71°C warmer than the long-term global average, with a best estimate of around 0.57°C, according to the Met Office annual global temperature forecast.

Global average temperature is expected to remain between 0.28 °C and 0.59 °C (90% confidence range) above the long-term (1971-2000) average during the period 2013-2017, with values most likely to be about 0.43 °C higher than average.

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6 Ibid.
1.2.4 The Scottish Government has played an active role as part of UK efforts to lobby for **higher EU ambition** on climate change targets for 2020 and beyond, arguing that the levels of emissions reduction across the EU are already deeper than expected\(^8\), and that the costs are now lower, and the benefits now higher, of moving beyond 20%. It is our firm position, and a policy in this draft RPP2, that the EU should move to a **30% emission reduction climate change target for 2020**.

1.2.5 Along with the UK Government, we are disappointed that the EU Environment Council has not yet been able to reach political agreement on higher emissions reductions, consistent with the cost-benefit analysis undertaken by the European Commission in the Low Carbon Roadmap 2050. We are pleased, though, that the European Commission will continue to develop proposals for further emissions reduction by 2020, and beyond to 2050, including reform of the EU Emissions Trading System\(^9\) (EU ETS), and that discussions on decarbonisation of the energy sector and the EU’s strategy for renewable energy, post-2020 are on-going.

1.2.6 Beyond Europe, and in line with our new role in the world, we have been strengthening our support for **developing countries**. We are championing climate justice, a key issue for human rights in the 21\(^{st}\) century that is rising up the UN agenda. We launched our **Climate Justice Fund** in June 2012 and announced the first awards for **five projects** prior to the Doha UNFCCC conference. Scotland has also been invited by the UN Secretary-General Ban Ki-moon to work with the UN’s Sustainable Energy for All initiative and we have announced a partnership with United Nations Development Programme (UNDP) to develop a renewable energy toolkit for use in developing nation economies. Our **International Development Fund** has funded a range of projects - from renewable energy projects in Malawi to climate change projects in other Sub-Saharan African countries.

1.2.7 At Doha, Scotland committed to host an **international conference on climate justice** in 2013 with the Mary Robinson Foundation. In addition to this work, we have a Memorandum of Understanding with the Inter-American Development Bank to share Scottish know-how on clean energy. We are collaborating with the **Global Carbon Capture and Storage Institute**, and we are working with South Africa on the feasibility of a carbon capture and storage pilot. **Our Saltire Commonwealth Fellowships** support the

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\(^8\) The European Commission has indicated that the EU is on target to deliver a 27% reduction by 2020.

exchange of knowledge on climate change policy and technology between Scotland and Commonwealth countries.
The economics of climate change

As Lord Stern showed in his Report on the Economics of Climate Change,\(^\text{10}\) the cost of failing to act to reduce greenhouse gas emissions will ultimately far outweigh the cost of taking the necessary steps to stabilise our climate.

Stern estimated that without action, the overall costs of climate change will be equivalent to losing at least 5% of global gross domestic product (GDP) each year, now and forever. Including a wider range of risks and impacts could increase this to 20% of GDP or more. Costs include those related to losses from declining agricultural production, heat waves, droughts, flooding events, extreme precipitation, biodiversity loss, disease spread, and soil erosion.

Conversely, the study estimated that stabilising greenhouse gases to avoid a temperature increase in excess of 2°C by 2050 would cost the global community roughly 1% of GDP by 2050. In 2008, Stern increased the estimate for the annual cost of achieving stabilisation between 500 and 550 ppm to 2% of GDP to account for faster than expected climate change.

1.3 How Scotland compares to other countries

1.3.1 Scotland is at the top of the European league table for emissions reductions. Between 1990-2010, emissions in Scotland fell by 22.8%. This is the largest reduction among the EU-15 Member States, and higher than the EU-27 Member States average of 14.3% when emissions from international aviation and shipping and land use, land use change and forestry sectors are factored in.

1.3.2 Under the Kyoto Protocol, EU Member States (then the EU-15) agreed to collectively reduce their greenhouse gas emissions to 8% below 1990 levels over the period 2008-2012, with Member States taking on differentiated targets in recognition of their national circumstances. Ten of the remaining twelve EU member states, (the EU-12), committed to individual targets under the Protocol. Of the EU-12, eight Member States have a target to reduce their emissions by 8% Hungary and Poland have a target of 6% and Cyprus and Malta have no target.

\(^\text{10}\) The Stern Review: [http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/sternreview_index.htm](http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/sternreview_index.htm)
1.3.3 There is no official international data which compares Scotland’s emissions with other countries apart from the UK. The comparisons below are made by the Scottish Government with unadjusted Scottish figures including international aviation and shipping and emissions from the Land Use, Land Use Change and Forestry (LULUCF) sector as detailed in the official statistics publication, “Scottish Greenhouse Gas Emissions 2010”\(^\text{11}\). They do not include any adjustment for the effect of the EU Emissions Trading System (ETS).

Table 1.1: How Scotland compares

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<thead>
<tr>
<th>Member State</th>
<th>Change 1990-2010</th>
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<th>Change 1990-2010</th>
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<tbody>
<tr>
<td>Austria</td>
<td>20.3%</td>
<td>Bulgaria</td>
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<td>Belgium</td>
<td>-1.2%</td>
<td>Cyprus</td>
<td>66.9%</td>
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<td>Denmark</td>
<td>-18.5%</td>
<td>Czech Republic</td>
<td>-30.1%</td>
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<td>Finland</td>
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<td>Estonia</td>
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<td>France</td>
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<td>Hungary</td>
<td>-32.2%</td>
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<tr>
<td>Germany</td>
<td>-20.3%</td>
<td>Latvia</td>
<td>-1.6%</td>
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<td>Greece</td>
<td>11.4%</td>
<td>Lithuania</td>
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<td>Ireland</td>
<td>11.6%</td>
<td>Malta</td>
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<td>Italy</td>
<td>-6.5%</td>
<td>Poland</td>
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<td>Luxembourg</td>
<td>3.7%</td>
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<td>Netherlands</td>
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<td>Slovakia</td>
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<td>Portugal</td>
<td>15.9%</td>
<td>Slovenia</td>
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<td>Spain</td>
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<td>United Kingdom</td>
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<tr>
<td>United Kingdom</td>
<td></td>
<td>United Kingdom</td>
<td>-20.9%</td>
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</tbody>
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1.3.4 Countries around the world are increasingly aware of the pressing need to act to tackle climate change, and are making policy commitments or passing legislation setting out how they propose to act. The Climate Change (Scotland) Act 2009 remains an exemplar, with a world-leading legally binding target to reduce greenhouse gas emissions by 42% compared

\(^{11}\) Scottish Greenhouse Gas Emissions 2010: [www.scotland.gov.uk/Publications/2012/07/9583/1](http://www.scotland.gov.uk/Publications/2012/07/9583/1)
to 1990 levels by 2020. Denmark and Germany have **pledged** 40% reductions, and the UK has committed to 34%

1.3.5 The level of ambition shown by many developed countries is inadequate, and where pledges have been made they often have a number of conditions attached. Many countries are setting a good example, with Mexico and South Africa among those with ambitious greenhouse gas emission reduction targets. Scotland’s targets are based on a wealth of scientific evidence showing the scale of action required to avoid catastrophic climate change across the globe. Other countries should follow our lead and commit to ambitious action.

“In Scotland, we are proud of the fact that the Scottish Parliament has unanimously passed the world’s toughest climate change legislation requiring us to reduce greenhouse gas emissions by 42% by 2020…

“Addressing climate change is not solely an environmental and moral imperative, however. The development of renewable energy is also a massive economic opportunity for Scotland.”

First Minister, Renewable UK Annual Conference, October 2012.

1.4 **Limited powers**

1.4.1 The approach to the proposals and policies in this document reflects the limitations in the powers currently available to Scotland. In a number of important areas, such as energy and agriculture, legislative competence is retained at UK or EU level. In respect of all international negotiations between member states, Scotland does not have a direct voice, for example at the UNFCCC, the EU Environment Council, and Agriculture and Fisheries negotiations.

1.4.2 The Scottish Government has a powerful vision of Scotland’s future as an energy rich country. Full powers over energy policy will be a dramatic step forward in maximising the economic and environmental benefits of Scotland’s energy resources. Scotland has abundant renewable energy resources; with 25% of EU offshore wind and tidal and 10% of EU wave energy potential, Scotland is already building on its North Sea expertise to rebuild our engineering and manufacturing industries and to become the green energy capital of Europe. With full powers we can do even more - our low carbon industry could be 10% of Scotland’s economy by 2015-16 and provide 5% of all jobs by 2020 if we exploit our competitive advantages.
1.4.3 Accessing these vast resources of green energy will also help to provide stable energy prices for customers, by reducing dependence on fossil fuels, and volatility of wholesale gas and oil prices, and provide a major contribution to reducing our carbon emissions. Building on our existing track record of promoting energy efficiency effectively and creatively, full legislative and regulatory powers will enable a much greater focus on energy efficiency measures and tackling fuel poverty, by enabling approaches that are appropriate for Scottish customers.

1.4.4 In the meantime, decisions taken by the UK, for example in terms of fiscal policy, demonstrate that, without the same financial and economic powers as other nations, Scotland currently has limited flexibility when it comes to implementing measures to reduce emissions through, for example, vehicle and fuel duties. This means that more options need to be identified from existing powers, and there is, therefore, a need to consider more radical options than might be required if Scotland had a full complement of fiscal and policy responsibilities. In these circumstances, Scottish Ministers will continue their policy of pursuing and influencing decisions at UK and EU levels, to encourage a greater level of ambition in accordance with existing practice.

1.5 Low carbon Scotland – our vision

1.5.1 The term ‘low carbon Scotland’ is common in the policy world. But what will meeting our climate change targets mean in terms of outcomes? In 2009, the Scottish Government published Scotland's Climate Change Delivery Plan. It includes four transformational outcomes we believed to be necessary for our target of an 80% greenhouse gas emission reduction by 2050 to be met. They highlight the sectors that are responsible for significant greenhouse gas emissions in Scotland - electricity production, heat, transport and land use.

1.5.2 Three years on, we feel it is time to broaden these out with further detail:

- A largely de-carbonised electricity generation sector by 2030, using renewable sources for electricity generation with other electricity generation from fossil fuelled plants utilising carbon capture and storage;

- A largely de-carbonised heat sector by 2050 with significant progress by 2030 through a combination of reduced demand and

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energy efficiency, together with a massive increase in the use of renewable or low carbon heating;

- **Almost complete decarbonisation of road transport by 2050**, with significant progress by 2030 through wholesale adoption of electric cars and vans, as well as significant modal shift towards public transport and active travel, and significant decarbonisation of rail;

- A step change in provision of **energy efficient homes to 2030** through retrofit of existing housing and improved building regulations for new build homes;

- **Significant progress in transforming energy use in industry, business and the public sectors by 2027** through energy efficiency, and the decarbonisation of heating and cooling processes;

- **At least 70% all waste will be recycled by 2025**, and by **2050 waste** as we know it now will have been designed out of our economy;

- **By 2027** land managers will have further optimised the **productive use of natural resources**, producing food and delivering public goods, such as protecting the natural environment and reducing greenhouse gas emissions; and

- **By 2027** we will have enhanced **natural carbon capture** through our expanded woodlands and significantly more conservation of our peatland.

### 1.6 Climate change adaptation

#### 1.6.1 As we work towards our vision of a low carbon Scotland, it is essential that we take into account actual climate change in Scotland. Due to past and present global emissions, our climate will continue to change for at least the next 30 to 40 years. We cannot prevent this change, but we can be more resilient in the face of change.

#### 1.6.2 It is important that we plan our mitigation interventions in the context of Scotland's changing climate as the climate may have an impact on the siting of specific infrastructure, on performance of our agriculture and forestry sectors with implications for land use strategy, on the uptake of particular measures, and on the effectiveness of measures.
1.6.3 Our first statutory *Climate Change Adaptation Programme*\(^3\) will seek to identify and address the key threats to Scotland from the changing climate and to maximise the opportunities it will present. In advance of the Programme, the non-statutory Adaptation Framework\(^4\) aims to build resilience and capacity to adapt to the changing climate.

Over the last few decades it has become warmer, but also wetter, with an increase in both the amount of rainfall (especially in winter) and the occurrence of heavy downpours.\(^5\) A rise in temperature of a few degrees would create conditions unlike anything experienced in Scotland today. We may have fluctuating temperatures and more frequent and/or prolonged periods of high rainfall or drought, leading to more extreme weather events, like heat waves or heavy rainfall.\(^6\)

Potential impacts from the changing climate in Scotland will affect communities, the economy and the environment. The threats are wide-ranging. Examples include: reduction in river flows and water availability during the summer; increased risks of pests and diseases to agriculture and forestry; increases in flooding through more intense precipitation events which would affect properties; infrastructure and people; changes in, or loss of, species and habitats; and increased disruption from extreme weather events.

1.6.4 As well as understanding Scotland’s changing climate, we need to understand the interactions between potential mitigation actions and potential adaptation actions. We will take advantage of synergies already identified, for example woodland planting can provide natural flood defences, and address any negative relationships (for example where a mitigation intervention reduces resilience or vice versa).

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\(^3\) Scottish Climate Change Adaptation Programme: [www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/adaptation/AdaptationProgramme](http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/adaptation/AdaptationProgramme)


\(^6\) UK Climate Projections: [http://ukclimateprojections.defra.gov.uk/21708](http://ukclimateprojections.defra.gov.uk/21708)
2. **Background and context**

2.1 **A whole Government approach**

2.1.1 Tackling climate change in respect of leadership, policy, regulatory frameworks and project delivery is the responsibility of every part of the Scottish Government, its agencies, and local government. We are setting long term consistent and stable policy frameworks, working to ensure we understand how these relate to and impact on different parts of the Scottish economy and society.

2.1.2 We are working to maximise synergies, ensuring that all major policy initiatives take into account climate change impacts. We are taking action on our own estates, as well as maximising investment opportunities for low carbon activity through our procurement processes. The Public Bodies Climate Change Duties\(^ {17}\) in the Climate Change (Scotland) Act provide the statutory underpinning for action by public bodies relating to a number of these aspects.

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**Scotland’s Procurement Reform Bill**

Scotland’s Procurement Reform Bill\(^ {18}\) will establish a national legislative framework for sustainable public procurement that supports sustainable economic growth by delivering community benefits, supporting innovation, and considering environmental requirements. The Bill will also promote public procurement processes and systems that are transparent, streamlined, standardised, proportionate, fair and business friendly.

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2.2 **Our guiding principles**

2.2.1 We are determined to tackle climate change in a way that both benefits and includes the people of Scotland. To do this, we have a number of principles to guide our approach.

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\(^{17}\) The Public Bodies Climate Change Duties: [www.scotland.gov.uk/Publications/2011/02/04093254/1](http://www.scotland.gov.uk/Publications/2011/02/04093254/1)

\(^{18}\) Procurement Reform Bill: [www.scotland.gov.uk/Topics/Government/Procurement/policy/ProcurementReform](http://www.scotland.gov.uk/Topics/Government/Procurement/policy/ProcurementReform)
2.2.2 **Sustainable.** Sustainable development is integral to the Scottish Government’s purpose. As we develop and implement emission reduction policies we will follow the five broad principles of sustainability:

- living within environmental limits;
- a strong, healthy and just society;
- a sustainable economy;
- promotion of good governance; and
- responsible use of sound science.

### The agenda for cities

As set out in the Agenda for Cities, Scottish cities recognise the importance of sustainability and are keen to make the transition to a low carbon economy in a way which maximises economic benefits. As part of a range of measures, the Scottish Cities Alliance is considering carrying out “Mini Stern” reviews for each city that identify bespoke as well as collaborative opportunities for investment.

2.2.3 **Cost effective.** Where there are choices within and between policies, we will choose the most cost effective options, minimising costs to businesses, public organisations and households. This approach is explained in more detail in the funding and financing section later in the document.

2.2.4 **Portfolio of diverse technologies.** While we intend to choose the most cost effective mix of technologies and approaches in any sector, the reality is that, in many cases, we do not yet know how technologies will develop, or how their costs will change or what other disruptive technologies might emerge. We aim, where reasonable and practical, to encourage a portfolio of technologies and create competitive market conditions in which the most sustainable and cost effective succeed over time.

2.2.5 **Inclusive.** We will continue to work for and with the people of Scotland. We will consult, we will listen, and we will continue to learn from households, communities, non-government organisations, public sector partners, and businesses and industry as we adapt to new ways of doing things. The transition to a low carbon Scotland will involve all of us working together. Indeed, the Scottish Government is grateful for the engagement by the stakeholder community in the preparation of this draft RPP2.²⁰

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¹⁹ Scottish Cities Alliance: [http://scottishcities.wordpress.com/](http://scottishcities.wordpress.com/)
²⁰ For example, many people made significant effort to participate in two RPP2 workshops held in Edinburgh in May and September 2012.
2.2.6  **Fair.** Changing the way we do things, alongside our adoption of new technologies, will involve costs and benefits for many people. We will ensure that costs and benefits are distributed fairly, and pay special attention to the least well off in our communities, as well as minimising any unnecessary burdens on businesses and the third sector. Equalities impact assessments and individual business and regulatory impact assessments are part of the formal processes for implementing this principle.

2.2.7  **Transparent.** The transition to a low carbon Scotland will involve some disruption and significant change although these are required to avoid even greater disruption and damaging change likely if global temperature rises exceed 2 °C. We will ensure that where possible, our assumptions, our data, and our decision making processes are clear and accessible as we work through the transition. The Technical Annex to this report provides the main assumptions behind the data in the tables in this report.

### 2.3 The Climate Change (Scotland) Act 2009 - statutory duties

**2.3.1** The Climate Change (Scotland) Act 2009 (‘the Act’) sets targets to reduce Scotland’s emissions of the basket of six Kyoto Protocol greenhouse gases\(^{21}\) by at least 42% by 2020 and 80% by 2050, compared to the 1990/1995 baseline. As well as domestic emissions, Scotland’s share of emissions from international aviation and shipping are included in the targets, unlike the UK Government which has deferred a decision on including aviation and shipping in its own targets until 2016.

**2.3.2** The Act requires Scottish Ministers to set annual targets for emissions at least 12 years in advance. In October 2010, the Scottish Parliament passed legislation setting the first batch of annual targets, for the years 2010 to 2022. One year later, the Scottish Parliament passed subsequent legislation setting the second batch of annual targets, for the years 2023 to 2027.\(^{22}\) Details of the targets are at section 2.4 below.

**2.3.3** The Act requires that, as soon as reasonably practicable after setting a batch of annual targets, Ministers publish a report setting out proposals

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\(^{21}\) The basket of Kyoto Protocol greenhouse gases comprises carbon dioxide (CO\(_2\)), methane (CH\(_4\)) and nitrous oxide (N\(_2\)O), for which the baseline is 1990; and hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF\(_6\)), for which the baseline is 1995.

\(^{22}\) Secondary legislation made under the Climate Change (Scotland) Act 2009: [www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/climatechangeact/secondarylegislation](http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/climatechangeact/secondarylegislation)
and policies for meeting those targets. This draft RPP2 lays out how Scotland can deliver annual targets for reductions in emissions from 2013 to 2027. It sets the strategic direction towards further reductions in emissions of 80% in 2050. The trajectory towards 80% will likely result in a target of around 60% in 2030. Currently no 2030 target has been set for EU emissions, and Scotland will push the EU to demonstrate high ambition for 2030.

2.3.4 The Act requires that the report details progress on implementation of previous Reports on Proposals and Policies - in this case Low Carbon Scotland: Meeting the Emissions Reduction Targets 2010-2022 (RPP1), published in 2011. The analysis in this draft RPP2 shows that, based on assumptions set out in the report, we are on track to meet our targets and how, with concerted effort across the board, they could be met in each year up to 2027.

**Parliamentary scrutiny and revision**

This draft report was laid in the Scottish Parliament on 29 January 2013, and is subject to a 60-day period for Parliamentary consideration.

Before finalising RPP2, Ministers must have regard to any representations on the draft report, any resolution on the draft passed by the Scottish Parliament, and any report on the draft published by any Committees of the Parliament.

We plan to lay the final version of RPP2 in Parliament by the summer of 2013.

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23 The 2030 target will be set by the Scottish Parliament in the next batch of annual targets in 2016.

24 Low Carbon Scotland: Meeting the Emissions Reduction Targets 2010-2022: [www.scotland.gov.uk/Publications/2011/03/21114235/1](http://www.scotland.gov.uk/Publications/2011/03/21114235/1)
2.4 The greenhouse gas emission reduction targets 2013–2027

2.4.1 The targets, set out in the table below, are expressed in tonnes of carbon dioxide equivalent (tCO₂e). Percentages have been adjusted to use the 1990 baseline from the latest 2010 Greenhouse Gas Inventory. Scotland’s targets use the level of emissions in 1990 (for carbon dioxide, methane and nitrous oxide) and 1995 (for fluorine-based gases) as the baseline from which reductions are calculated.

<table>
<thead>
<tr>
<th>Target Year</th>
<th>Annual targets expressed in tonnes of CO₂ equivalent (tCO₂e)</th>
<th>% emissions reduction required year on year</th>
<th>% reduction against 1990 baseline when targets were set (2008 GHG Inventory)</th>
<th>% reduction against 1990 baseline using latest data (2010 GHG Inventory)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>53,652,000</td>
<td>N/A</td>
<td>-23.57%</td>
<td>-25.79%</td>
</tr>
<tr>
<td>2011</td>
<td>53,404,000</td>
<td>-0.46%</td>
<td>-23.93%</td>
<td>-26.11%</td>
</tr>
<tr>
<td>2012</td>
<td>53,226,000</td>
<td>-0.33%</td>
<td>-24.18%</td>
<td>-26.36%</td>
</tr>
<tr>
<td>2013</td>
<td>47,976,000</td>
<td>-9.86%</td>
<td>-31.66%</td>
<td>-33.62%</td>
</tr>
<tr>
<td>2014</td>
<td>46,958,000</td>
<td>-2.12%</td>
<td>-33.11%</td>
<td>-35.03%</td>
</tr>
<tr>
<td>2015</td>
<td>45,928,000</td>
<td>-2.19%</td>
<td>-34.58%</td>
<td>-36.45%</td>
</tr>
<tr>
<td>2016</td>
<td>44,933,000</td>
<td>-2.17%</td>
<td>-35.99%</td>
<td>-37.83%</td>
</tr>
<tr>
<td>2017</td>
<td>43,946,000</td>
<td>-2.20%</td>
<td>-37.40%</td>
<td>-39.20%</td>
</tr>
<tr>
<td>2018</td>
<td>42,966,000</td>
<td>-2.23%</td>
<td>-38.80%</td>
<td>-40.55%</td>
</tr>
<tr>
<td>2019</td>
<td>41,976,000</td>
<td>-2.30%</td>
<td>-40.21%</td>
<td>-41.92%</td>
</tr>
<tr>
<td>2020</td>
<td>40,717,000</td>
<td>-3.00%</td>
<td>-42.00%</td>
<td>-43.66%</td>
</tr>
<tr>
<td>2021</td>
<td>39,495,000</td>
<td>-3.00%</td>
<td>-43.74%</td>
<td>-45.36%</td>
</tr>
<tr>
<td>2022</td>
<td>38,310,000</td>
<td>-3.00%</td>
<td>-45.43%</td>
<td>-46.99%</td>
</tr>
<tr>
<td>2023</td>
<td>37,161,000</td>
<td>-3.00%</td>
<td>-47.06%</td>
<td>-48.58%</td>
</tr>
<tr>
<td>2024</td>
<td>35,787,000</td>
<td>-3.70%</td>
<td>-49.02%</td>
<td>-50.49%</td>
</tr>
<tr>
<td>2025</td>
<td>34,117,000</td>
<td>-4.70%</td>
<td>-51.40%</td>
<td>-52.80%</td>
</tr>
<tr>
<td>2026</td>
<td>32,446,000</td>
<td>-4.90%</td>
<td>-53.78%</td>
<td>-55.11%</td>
</tr>
<tr>
<td>2027</td>
<td>30,777,000</td>
<td>-5.10%</td>
<td>-56.16%</td>
<td>-57.42%</td>
</tr>
</tbody>
</table>

25 As discussed in this section of the document, any methodological updates to the Greenhouse Gas Inventory are backdated to 1990 wherever possible. This means that the total estimated level of Scottish emissions in 1990 can change in each edition of the Inventory. Adjusting to include a Scottish share of emissions from international aviation and shipping, the 2008 Inventory estimate for 1990 was 70,201,000 tCO₂e. In the 2010 Inventory the estimate for 1990 was revised upwards to 72,275,734 tCO₂e.

26 The large drop in 2013 reflects Phase III of the EU Emissions Trading System coming into effect, with a corresponding reduction in the available number of emissions allowances.
2.4.2 As discussed further below, the methodology that underpins the Scottish Greenhouse Gas Inventory is under continual review in order to improve its accuracy. Each amendment to the Inventory is calculated back to 1990. This means that when the Inventory is published each year, Scotland’s 1990/1995 baseline is updated.

2.4.3 The effect of this is that the total quantity of emissions that need to be abated to meet the annual targets can vary depending on the baseline. For example, the annual targets for 2010 to 2022 were set using the baseline from the 2008 Inventory and the 2020 target (requiring that emissions not exceed 40.717 MtCO$_2$e) equated to a 42% reduction on this basis. However, the baseline in the current 2010 Inventory is slightly higher than the equivalent calculation two years previously. The result is that the 2020 annual target now equates to a 43.66% reduction in emissions.

2.5 Estimating emissions reductions: business-as-usual profile

2.5.1 To quantify the effect of policies and proposals in reducing emissions, and thus the contributions to the reduction targets, we need to consider what would happen to future emissions in the absence of such interventions. The ‘business-as-usual’ (BAU) emissions profile provides an estimate of future annual emissions out to 2027 under assumptions on factors such as economic growth, fuel prices, projected growth in both the population and number of households. The emissions reduction (abatement) from policies and proposals is then subtracted from the BAU to calculate what future emissions are likely to be with policies and proposals in place.
2.5.2 For the purposes of this report, a BAU emissions profile has been developed for the non traded sector, against which the abatement from policies and proposals is deducted. The traded sector is presented as a net-emissions profile. (Further information on these sectors is in section 2.7 below). Emissions in the traded sector are calculated on the basis of two scenarios to 2020, which merge into the same scenario thereafter:

- **Under the ETS 20% scenario for the period to 2020**, we use the existing trajectory for the ETS based on Scotland’s share of the EU-wide reduction in emissions of 20% by 2020 on the 2005 baseline used by the ETS. This is the current legislative requirement, and forms the basis for measuring Scotland’s “traded” sector emissions on an annual basis.

- **Under the ETS 30% scenario for the period to 2020**, we use the trajectory for the ETS based on Scotland’s share of the EU-wide reduction in emissions of 30% by 2020 on the 2005 baseline. This trajectory was described in full in RPP1 and remains our policy objective.

- Specific details regarding the EU ETS for the period beyond 2020 have not yet been established. Rather than base our calculation on a Scottish share of a nominal ETS trajectory, after 2020 the traded sector is presented in this report as ‘net emissions’ based on
estimates of direct future electricity generation emissions in Scotland and from the CCC target advice that identifies abatement from other non-electricity generation installations within the traded sector.

2.6 The Committee on Climate Change target advice

2.6.1 The BAU is important not only for understanding the effects of our policies and proposals, but also, critically, for how the reduction targets were set. The Committee on Climate Change (CCC) provides independent expert advice to government about all aspects of climate change. The 2023-2027 annual emission reduction targets were informed by advice published by the CCC in 2011. Whilst this report draws in part on the CCC’s advice, since its publication, new emissions data and projections have become available which provide more up to date insights into future Scottish emissions and the abatement required to meet annual targets.

2.6.2 Chart 2.1 shows the non-traded sector BAU projection used by the CCC in its target advice to the Scottish Government in 2011 and the higher, more up to date, emissions profile that is used in this report. Importantly, the amount of abatement that this draft RPP2 indicates is required to meet the annual targets is much greater than that needed in the CCC advice. In 2027, this difference amounts to some 4.1 MtCO\textsubscript{2}e. Scotland therefore needs to outperform the emissions abatement the CCC suggested would be necessary in order to meet the targets.
Chart 2.1: Non-traded sector BAU projection used by the CCC

Comparing Non-Traded BAU Emissions Projections

Measuring our progress

Achievement of Scotland's targets is measured against the level of the Net Scottish Emissions Account (NSEA). This accounts for the greenhouse gas emissions from sources in Scotland, Scotland's share of emissions from international aviation and international shipping, the effect of any relevant emissions sequestration (e.g. “carbon sinks” such as woodland) and the effect of the sale and purchase of relevant emissions allowances.

Scotland’s emissions are disaggregated from UK data and are reported annually in the Greenhouse Gas Emissions Inventory for England, Scotland, Wales and Northern Ireland. Regulations set down in detail how the NSEA will be calculated from the disaggregated Inventory.

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2.7 Explaining the traded and non-traded sectors

2.7.1 The official source of greenhouse gas emissions data that is used by the Scottish Government is the National Atmospheric Emissions Inventory (NAEI). The NAEI compiles estimates of emissions to the atmosphere from UK sources and is used as the basis for setting the Scottish annual climate change targets and for assessing progress against the targets.

2.7.2 The advent of the EU ETS in 2005 meant that emissions were split into those accounted for in the ‘non-traded’ sector and those in the ‘traded’ sector. The non-traded includes greenhouse gas emissions captured in the NAEI in Scotland that do not fall under the EU ETS. They can be disaggregated into the following sources of emissions: residential, non-traded business, industry and public sector, transport, agriculture and related land use, forestry, waste sector, and development (land use). Traded sector emissions include emissions from the generation of electricity, energy intensive business and industrial processes such as production of steel and iron, and energy intensive parts of the public sector such as large hospitals.29 The trading scheme exists so that organisations have to pay for the CO\textsubscript{2}e they emit and so acts as an incentive for them to reduce their emissions. The EU ETS enters its third phase in 2013 and aims by 2020 to reduce EU wide emissions by 20% compared to emissions in 2005.

The role of the EU ETS and the traded sector

2.7.3 The EU ETS, is implemented at the Member State level and Scotland participates in the ETS as part of the UK. The cap and trade nature of the scheme is designed so that emission reductions take place in the most cost effective manner, thus encouraging operators to invest in low emission technologies and techniques, such as more energy efficient equipment or less emission intensive energy sources.

2.7.4 The scheme is focussed on large, energy intensive installations as well as all emissions from flights arriving at and flying from European airports from the start of 2012. As part of on-going international negotiations the European Commissions has implemented a ‘stop the clock’ proposal on flights into and out of Europe, see section 7.4 for further details. Industry participants include cement and glass manufacturing as well as some distilleries. In Scotland there are 110 operators from a variety

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29 As part of an EU wide process to develop the EU ETS in phase 3 (2013-2020), official submission of public sector ‘opt-outs’ have been made to the European Commissions for consideration. These are due to be resolved later in the year and as such have not been incorporated into this document.
of sectors, which emitted approximately 24 MtCO$_2$e in 2010. Most operators receive a set number of free EU Allowances (EUA), with each EUA covering one tonne of CO$_2$e, and must trade or buy at auction any additional EUAs they require. As there is a set number of total EUA's within the market, the overall environmental targets are maintained.

2.7.5 The current EUA price is lower than had been expected, due mostly to the global economic downturn, and this has resulted in a smaller incentive to reduce emissions. Scottish Government officials are working closely with the UK Government’s Department of Energy and Climate Change (DECC) to engage with the European Commission on potential structural reforms that could create a more effective EUA price.

2.7.6 The Commission has recently proposed to address this in the short term by adjusting the timing in which allowances are introduced to the market (through a process of 'back-loading'). This would alter the auctioning timetable and reduce the numbers of allowances auctioned in the early part of Phase III (2013-2020), and re-introduce them near the end of the Phase (in 2019-2020). The Commission's recent Carbon Market Report provides an outline of six measures that would lead to longer-term structural reform:

- an EU 30% greenhouse gas reduction target for 2020;
- the permanent cancellation of allowances;
- a change to the annual linear reduction factor;
- the inclusion of extra sectors;
- a review of inclusion of international project credits; and
- the establishment of price management mechanisms.

2.7.7 The Scottish Government has welcomed publication of the report as part of our push for the EU to raise its 2020 greenhouse gas emission reduction target to 30% which would be consistent with our own domestic target of 42%. While a number of Member states are opposed to any further structural reforms of the ETS, and to the EU raising its 2020 target to 30% the Scottish Government will continue to work strongly in support of efforts to reform to ensure the ETS delivers the policy and regulatory certainty to investors to incentivise cost-efficient emissions reduction in line with our own domestic targets. The Commission will also publish a new Communication during 2013 on an EU greenhouse gas reduction target for 2030 (the figure given in the Commission's (2011) Low Carbon Roadmap 2050 was 40%).

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2.8  The emissions abatement trajectory

2.8.1  A full year by year breakdown of the estimated emissions impact of proposals and policies is shown in Annexes A and B at the end of this document. The analysis shows that:

- Our policies and proposals give us **significantly more abatement** than the Committee on Climate Change suggested is both an appropriate global contribution from Scotland and in line with our potential.

- By the mid-2020s, despite the lack of progress in strengthening the EU 2020 emissions target, the amount of our planned non-traded abatement is approximately **2 MtCO₂e** a year greater than the Climate Change Committee recommendation.

- Working from the **original projections** used by the Climate Change Committee in giving the Scottish Government advice on the level of annual targets, we would meet the annual targets in all years, even if the EU retains a 20% emissions cap rather than moving to a 30% one.

- However, our latest data and analytical models give us a **higher non-traded business as usual (baseline)** than the Climate Change Committee originally provided. In 2027, this amounts to **4.1 MtCO₂e** more than the CCC BAU.

- Using projections based on this new, more up to date work, in effect makes the targets set under the Climate Change (Scotland) Act more difficult to achieve. However, the package of proposals and policies set out in this draft RPP2 has the potential to deliver emissions abatement that would meet all of the annual targets set to 2027 in circumstances where the EU strengthens its Emissions Trading System in line with an EU-wide emissions reduction target of 30% for 2020. If the EU ETS does not make this contribution, our proposals and policies could still meet all of the targets after 2020 as the energy generation sector decarbonises.

2.8.2  Annex B presents information on the extent to which project that we will either undershoot or overshoot the annual targets in each year on the assumption of either a 20% or 30% EU emissions cap. Chart 2.2 illustrates how this achieved with a 30% cap. The Business as Usual projection line is shown at the top of the chart; our policies are then subtracted to give net emissions after the delivery of policies; finally our proposals are subtracted to give net emissions after delivery of policies and proposals.
2.8.3 When the Climate Change (Scotland) Bill was being debated in the Scottish Parliament in 2008 it was widely acknowledged that an increased contribution from the EU Emissions Trading System, stemming from an increase in the EU 2020 emissions target from 20% to 30%, was very important for meeting the extended level of ambition represented by the Scottish 42% target set for 2020. However, the subsequent economic downturn and disappointing progress at international climate change negotiations have made such a move by the EU more difficult to achieve consensus around.

2.8.4 While we have set out policies and proposals to further enhance domestic effort, as stated previously, our policy remains that the EU should move to 30% as this is what is required as part of a global effort to avoid dangerous climate change. The Scottish Government supports the UK and other progressive Member States in their efforts to persuade the EU to increase its 2020 emissions reduction target above 20% unilaterally. We will review this position during the production of RPP3.
2.9  The domestic effort target

2.9.1 The Act places a duty on Scottish Ministers to ensure that reductions in net Scottish emissions of greenhouse gases account for at least 80% of the reduction in the net Scottish emissions account (NSEA) in any target year. The domestic effort target limits the quantity of carbon units (i.e. tradable emissions allowances) that Scottish Ministers may use to reduce the NSEA in any target year. The exception is carbon units surrendered by participants in the EU ETS which are accounted for in line with international practice.

2.9.2 While it remains an option for consideration, in line with previous commitments, we have no proposals or policies to purchase carbon units in this draft RPP2. Our focus is on measures that seek to reduce our emissions at source and for the long term. We intend, therefore, that the measures in this draft RPP2 will be consistent with meeting the domestic effort target in each target year even though this makes the tasks against which the Scottish Government will be judged even tougher.

2.10 The 2010 greenhouse gas emission reduction target

2.10.1 The first annual target under the Climate Change (Scotland) Act was set for 2010 and required that the net Scottish emissions account (NSEA) (comprising net emissions and the effect of the EU Emissions Trading System) for that year not exceed 53.65 MtCO$_2$e. The Greenhouse Gas Emissions Inventory for 2010 was published in 2012 and, together with data on the operation of the EU ETS in Scotland, it showed that the net Scottish emissions account for 2010 was 54.71 MtCO$_2$e. This means that the annual emissions target for 2010 was exceeded by 1.06 MtCO$_2$e.

2.10.2 More information about the 2010 annual target and emissions that year is contained in our formal report on the Scottish Greenhouse Gas Emissions Annual Target 2010,\textsuperscript{31} published in October 2012. There were two major factors that contributed to missing the 2010 target: an increase in emissions from residential heating attributable to the extreme cold weather experienced at the start and end of 2010; and revisions to historical data.

2.10.3 The average temperature for the six months January-March and October-December 2010 was the coldest since 1919. Scotland is not alone in experiencing the impact of this cold weather. In its recent progress report for our counterparts in the Welsh Government, the CCC noted that increased demand for energy during the winter months was a major contributory factor to the emissions covered by the Welsh climate change target increasing by 6% between 2009 and 2010.32

2.10.4 While missing the 2010 emissions target is disappointing, annual fluctuations in emissions around a downward trend are to be expected and the long term trend shows that emissions are reducing in Scotland. The 2010 increase in greenhouse gas emissions was the first year-on-year increase since 2006 and was significantly smaller than the rise in 2006.

2.10.5 In accordance with section 36 of the Climate Change (Scotland) Act 2009, this RPP2 sets out how the Scottish Government plans to compensate for missing the 2010 emissions target. It is our aim, where possible, to overachieve against future annual targets to recover the difference by which the 2010 target was missed. As is discussed elsewhere in this report, there are circumstances, in particular a stronger EU climate target, which would help achieve this aim more quickly. However, the collective emissions abatement potential of the package of proposals and policies in this report is such that the additional emissions in 2010 will be recovered over the period of this RPP2.

Committee on Climate Change Progress Report

The CCC submitted its first report, on the progress and activities of the Scottish Government towards meeting Scottish climate change targets, to Scottish Ministers in January 2012. This is an annual statutory requirement of the Act and one of the main mechanisms by which Scottish Ministers are held publically to account for their climate change duties.

The report focuses on the implementation of RPP1. David Kennedy, Chief Executive of the CCC said: “Good progress has been made by the Scottish Government in reducing emissions across the economy. Going forward, it will be important for the Scottish Government to continue to support the implementation of policies at both UK and national level to further cut emissions, resulting in climate change and wider economic benefits.”

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32 Committee on Climate Change, Welsh Progress Report 2013: www.theccc.org.uk/reports/welsh-reports
2.11 Definitions: policies, proposals and enabling measures

2.11.1 A policy is a course of action which has been wholly or largely decided upon. In many cases policies will have committed funding and/or legislation and timescales. Some policies are not owned by the Scottish Government (for example some European Directives or UK legislation). Many major policies (stemming from the EU) currently 'end' in 2020. Where this occurs we have made assumptions about how these might continue. These assumptions can be found in the relevant sections of the document.

2.11.2 A proposal is a suggested course of action, the details of which might change as this course of action is explored further. Some proposals are set to become firm policies once development work is completed and or financial resources allow. Other proposals could be considered more as propositions and these will be evaluated and developed if and when required to meet the targets. Wherever possible, the contribution of proposals to the achievement of the annual targets, and the costs of doing so, have been quantified. There are inevitable uncertainties in aspects of these estimates, particularly as we move towards longer time horizons.

2.11.3 A supporting and enabling measure is a measure which may not directly lead to a significant reduction in emissions, but which works mainly towards removing barriers or maximising the success of other policies.

2.11.4 These definitions are provided as guidance. Inevitably some measures will fall between them. The schedule of work to develop and implement each policy and proposal in this document will start from the position that the policy or proposal presently occupies in relevant government programmes.

2.11.5 Meeting the annual targets obviously requires different types of actions. Some of these will be strategic, involving small numbers of major sites (such as the development of carbon capture and storage) whereas others will involve relatively small changes that are population wide (for example, retrofitting energy efficiency measures in homes across Scotland or modal shift in transport use). In some cases, the action needed will be ground breaking and the result forecast, but not known for certain.

2.11.6 We are taking a non-site specific approach to identifying policies and proposals. For example, while we commit to decarbonising heat supply, we do not identify specific future district heating schemes except by way of illustration.
2.12 How we deal with costs and benefits

2.12.1 Costs and benefits can be considered both in the short and longer term. This document has been prepared during the 2012-2015 budget period. One of the three priorities of the 2013-14 budget is to accelerate economic recovery, create jobs and secure new opportunities through the low carbon economy.

2.12.2 We have provided the Scottish Parliament with a summary paper outlining our proposed expenditure on climate change related activity for 2013-14 and 2014-15. Scottish Government funding for climate change activities is less than the costs outlined in this document because the costs are to society as a whole, rather than to the Government alone. In addition our current spending plans only go out to the financial year 2014-15.

2.12.3 The measures in this report create costs and benefits for government, business and private households. We estimate the costs of implementing these measures to be on average £1.6 billion per annum (or 1% of GDP) while the average benefits are estimated to amount to £1.2 billion (in 2011 prices) per annum. The estimated benefits are very partial and primarily reflect the increased energy efficiency resulting from the investment in climate change policies and proposals. In particular they do not include the benefits associated with reduced global warming. The Stern Report estimated that these benefits at a global level to be between five and twenty per cent of GDP. Neither do the figures include benefits such as job creation, health improvement, local air quality and biodiversity.

2.12.4 The cost figures do not include transformational investments in the electricity sector. In addition, there are some proposals for which cost estimates are not available at this stage.

2.12.5 The proposals outlined in the draft RPP2 are in many cases at the start of the policy development process. As such, a full and detailed appraisal of the costs and benefits of proposals and their distribution between government, business and households has not been undertaken yet. This will be done at an individual proposal level as and when these proposals are converted to policies.

33 Climate Change Funding Document: www.scotland.gov.uk/Topics/Environment/climatechange/climatechangefundingdocument
2.13 **Consumption-based emissions**

2.13.1 Consumption-based emissions are all emissions attributable to the goods and services we consume in Scotland (as opposed to the domestic emissions on which our targets are based). The Act requires that Scottish Ministers report, in so far as is reasonably practicable, the emissions of greenhouse gases (whether in Scotland or elsewhere) which are produced by or otherwise associated with the consumption of goods and services in Scotland. These reports must be laid before the Scottish Parliament in respect of each year in the period 2010-2050. The reports\(^34\) can be accessed on the Scottish Government’s website.

2.13.2 Consumption-based emissions reporting is a complex and evolving field and we are working to determine the most suitable methodology on which to base our reports. In October 2009 we made available a time series (1992-2006) of the Scottish greenhouse gas footprint, including consumption estimates, which reflect this developing work.\(^35\) Subsequently, in May 2012 we published experimental data on Scotland’s greenhouse gas footprint for 2009\(^36\).

2.13.3 This draft RPP2 focuses on policies and proposals to reduce emissions as measured against the annual targets by the NSEA. While the impact of the proposals and policies on Scotland’s wider international emissions footprint has not been quantified here, the measures have been developed with the wider emissions impacts in mind. Wider, global emissions impacts can be quantified using 'consumption-based' emissions estimates and we are publishing such estimates on an annual basis. We plan to report on consumption based emissions for 2010 in 2013. Thereafter the intention is to report every three to four years to bring the time series up to date.

2.13.4 We have avoided developing policies or proposals that would result in a transfer of emissions to other countries rather than a genuine reduction. For example, decreasing the numbers of Scottish livestock would be unlikely to affect the amount of meat consumed in Scotland, and would therefore result in meat being imported with emissions overseas.

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2.14  Working with our partners

2.14.1  It must be emphasised that the Scottish Government cannot meet Scotland’s climate change targets alone. Local government in Scotland has a pivotal role too, alongside businesses, third sector organisations, communities, families, and individuals. However, in particular, Scottish local authorities have a position of influence both as organisations that deliver services and employ large workforces, and as members of Community Planning Partnerships.37

2.14.2  Local authorities have demonstrated leadership on climate change with the signing of their Climate Change Declaration38 and the inclusion of local outcomes related to climate change in Single Outcome Agreements. Local government has a key role in fulfilling the statutory obligations of the Act, as well as providing leadership to wider civil society.

Scotland's Climate Change Declaration

All Scotland's 32 local authorities have signed up to Scotland's Climate Change Declaration. Acknowledging the reality and importance of climate change, they commit to: mitigating their impact on climate change through reducing greenhouse gas emissions; taking steps to adapt to the unavoidable impacts of a changing climate; and working in partnership with their communities to respond to climate change.

The Declaration recognises that Scottish local authorities play a key role in their collective response to the challenge of climate change, and publicly demonstrates their commitment to action. Signatories do not need to have taken action on climate change to sign the Declaration, but by signing they are expected to play their part. Signatories also agree to issue an annual statement, detailing the progress of their climate change response.

The process is driven by the Sustainable Scotland Network (SSN), with support from the Scottish Government, and we will continue to work with SSN, COSLA39 and individual local authorities to ensure the success of the initiative, aligning it with related reporting requirements in the broader public sector.

37 Details of community planning can be found at http://www.scotland.gov.uk/Topics/Government/PublicServiceReform/community-planning
38 Scotland’s Climate Change Declaration: http://climatechange.sustainable-scotland.net/index.asp
39 COSLA: www.cosla.gov.uk
2.14.3 The 2020 Climate Group was established by Ian Marchant, Chief Executive of SSE, in 2009. It considers how Scotland’s business, voluntary and public sectors can work together to help achieve Scotland’s emissions reduction targets. The group is independent of Government and seeks input and guidance from the Scottish Government where appropriate. The Group published its 12 priority actions for 2012 in January and has developed 13 priorities for 2013.

2.14.4 The third sector has a central role too. Non-government organisations rally support and activity across Scotland, and in many cases act as delivery partners. There are also numerous community-based initiatives throughout Scotland demonstrating how low carbon living might be achieved - from renewable energy generation to local food production and organic markets. The Scottish Government’s Climate Challenge Fund (see paragraph 5.5.3) provides grants to community groups wishing to reduce their carbon emissions and tackle climate change.
### 2.15 How we got here – timeline summary

<table>
<thead>
<tr>
<th>Date</th>
<th>Milestone</th>
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<tbody>
<tr>
<td>June 2009</td>
<td>Scottish Government’s Climate Change Delivery Plan published.</td>
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<tr>
<td>June 2009</td>
<td>Climate Change (Scotland) Act 2009.</td>
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<tr>
<td>February 2010</td>
<td>Committee on Climate Change (CCC) advice to the Scottish Government on the 2020 interim target and annual emissions targets 2010 – 2022.</td>
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<tr>
<td>May 2010</td>
<td>The Climate Change (International Aviation and Shipping) (Scotland) Order 2010.</td>
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<tr>
<td>May 2010</td>
<td>The Carbon Accounting Scheme (Scotland) Regulations 2010.</td>
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<tr>
<td>July 2011</td>
<td>CCC advice to Scottish Ministers on the second batch of annual targets 2023 – 2027 received.</td>
</tr>
<tr>
<td>August 2011</td>
<td>CCC advice to Scottish Ministers on setting carbon unit limits 2013 – 2017 received.</td>
</tr>
<tr>
<td>October 2011</td>
<td>Scottish Government’s Climate Change Annual Targets (Scotland) Order 2011 setting the annual emissions targets 2023 – 2027.</td>
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3. Understanding and achieving transformation

3.1 Five cross cutting themes of transformation

3.1.1 We know that the transformation to a low carbon Scotland will be challenging - and it will involve more than just focussing on particular sectors. This section of the report outlines our strategic approach to five cross cutting themes:

- A strategic assessment of external factors that are driving the pace of change;
- Embedding achievement of the targets in the transition to a low carbon economy;
- Ensuring we collectively have access to a range of funding and financing mechanisms;
- Understanding the role of behaviour and decision making in achieving in the targets and influencing accordingly; and
- Recognising the long term role of our planning system.

3.2 Strategic assessment: understanding external drivers

3.2.1 There are a number of external drivers that are forcing the pace of change in energy and climate change issues. While there may be little we can do to directly influence them given current limitations of Scotland’s powers and ability to speak within key fora, it is important that we understand them and build future uncertainties into our long term planning.

3.2.2 The energy world is set to undergo profound change over the next 20 years as economies large and small - developed and developing - seek to make the transition to a low carbon world. As an open export-dependent economy, Scotland is reliant on access to international markets and flows of trade and investment across the globe. We will not be immune to global change. A number of factors are driving the pace of that change.

i. Role of Emerging economies in shaping future energy demand: In the period to 2030 industrialisation, urbanisation and rising living standards in China, India and the Middle East will increase global energy demand by over one-third. China will account for the largest share with its demand rising 60% followed by India where demand will more than double. By 2030, 60% of the world’s population will live in cities, with China adding 276 million - and India 218 million urban dwellers. Meantime, the number of people considered to be

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in the ‘global middle class’ is expected to grow as a percentage of overall population – further increasing pressure on per-capita consumption of resources.

ii. **A shifting global energy landscape:** The next 20 years will witness significant shifts in the global energy map, with implications for energy markets and trade. By 2035, the United States of America may be virtually self-sufficient in energy due to increased unconventional hydrocarbons, increased bio-energy, and improved fuel efficiency in transport. As North American energy exports increase, 90% of Middle Eastern oil exports will go to Asia. Changing patterns of energy production, balance of trade flows and import/export dependencies may redefine global economic and geopolitical balances.

iii. **Policy choices and priorities:** Policy makers face critical choices in reconciling energy, environmental and economic objectives. Global fossil fuel subsidies are still growing to $523 billion in 2011, up 30% from 2010. By comparison, global renewable energy subsidies amounted to only $8 billion in 2011. Cumulative investment required in new energy supply is estimated to total $37 trillion over 2012-2035. In the face of growing global energy demands, public policy will increasingly seek to reduce energy demand where possible – but energy efficiency dividends currently remain largely untapped, mostly due to non-technical barriers.

iv. **Forward Operating Environments:** As we look further ahead, beyond 2025, the degree of uncertainty increases to the point where projections alone are not sufficient. Therefore, considering alternative futures can offer one way to assess potential forward operating environments for Scotland. Scotland’s future energy and climate change prospects are especially interconnected with, and heavily influenced by:

- Economic growth -or- stagnation across the world which will significantly impact investor confidence, access to capital, opportunities for industrial and commercial collaboration, levels of energy demand and supply; and
- Weak -or- strong climate change mitigation policy implementation at home and overseas which will shape the competitive landscape for Scottish industry and exports, determine the fortunes of our

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41 Ibid.
42 Ibid.
energy technologies and energy services, and define the scope of our reductions in greenhouse gas emissions.

3.2.3 As part of the background work to this report, we explored a range of different futures, not as predictions, but rather in recognition of the potential for alternative and plausible operating environments ahead that we need to understand, including:

- A world where economic growth returns to pre-crisis levels and most governments invest in robust carbon reduction policies. However, behaviour change lags behind investment;

- A world of economic recovery, but where most debt-ridden governments prioritise growth near term to ensure security long term – all at the expense of investment in the low carbon transition;

- A world where indebted countries experience a decade of stagnation. But low carbon policies are not abandoned, but shifted towards low cost measures, especially to a focus on energy efficiency; and

- A world experiencing a decade of stagnation where the low carbon agenda is overshadowed by resource protectionism, minimising import dependencies, and prioritising a return of domestic growth.

3.2.4 The long term future requires our immediate attention. Policies over the next five years will shape the investments for the next ten years, which will largely define the global energy picture out to 2050. Strategic investments in infrastructure will commit us ahead for decades, battles for global standards may render otherwise promising emerging technologies redundant, and new energy solutions may create new resource dependencies.

3.2.5 Consequently, we are developing policies and proposals in an adaptive way, one which sets a clear direction and yet is sensitive to the fast changing operating context in which we compete. This draft RPP2 attempts to balance the need for a long term credible plan to meet our emission targets with the need to remain flexible to change.

3.2.6 Our policies and proposals should be able to flex in different futures. We expect our proposed transformational outcomes to remain largely steady, but our interventions, some technologies, our business models and our priorities may change as different ‘futures’ come to pass.
3.3 The transition to a low carbon economy

3.3.1 In the updated Government Economic Strategy\(^{43}\) published in September 2011, we established a new strategic priority, the ‘Transition to a Low Carbon Economy’ emphasising the central importance of low carbon to Scotland’s future economic success.

3.3.2 The earlier Low Carbon Economic Strategy for Scotland (LCES)\(^{44}\) sets out our approach in detail. It represents a bold vision for a fundamental restructuring in the domestic economy – moving it to a low carbon basis in advance of a similar restructuring across the global economy. Over the coming decades, consumer behaviour, business models, products, services and technologies will all adapt to a reduced reliance on carbon - this is the basis of an unprecedented economic opportunity for Scotland. The transformational changes required in our domestic economy are an investment to drive long-term growth and provide sustainable export markets for Scottish products and services.

3.3.3 There is a sound economic basis for our actions. Scotland’s abundant natural resources are the basis for a revolution in renewable energy, supported by the energy infrastructure and skills in our oil and gas industry. Our future success in developing innovative low carbon technologies is dependent on Scotland’s industrial and engineering excellence – and the outstanding performance of Scotland’s research institutions. And our successful services sector is the platform for an exportable services market in waste, resource efficiency and energy demand management.

3.3.4 Our support for the low carbon economy is provided through five channels:

i. **Long term legal and institutional certainty.** Business certainty and investment are prerequisites for a successful transition. Scotland’s world-leading statutory climate change targets and the accompanying actions in this report are the credible basis for long-term business certainty on Scotland’s low carbon commitment.

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ii. **Expanding renewable energy production.** The supply of clean electricity from renewable sources will reduce the major sectoral contributor of greenhouse gases - power generation - and represents the major economic opportunity for Scotland to capitalise on its rich natural resources. Our commitment to supply 100% of energy demand from renewable sources by 2020 will ensure that the indirect emissions of other sectors of the economy are also addressed. Indeed, by making such a significant contribution to meeting our targets, renewable energy can relieve pressure on other areas of Scottish society.

iii. **Improvements in energy and resource efficiency in households and industry.** The major opportunity outside renewable energy is in the emergence of new markets for services and products to improve the energy efficiency of the residential and industrial sectors, reducing fuel poverty in households and improving productivity and resource efficiency for business. The opportunities here are immense and span the construction, manufacturing and services industries.

iv. **Transition of transport to a lower carbon basis.** Transport is a significant source of Scottish greenhouse gas emissions. Scotland has key competitive strengths to exploit in new and emerging transport technologies, for example, hybrid buses and ferries, and fuel cells and batteries (in line with our clean electricity story).

v. **Expansion of renewable sources of heat.** We can support the provision of private and public infrastructure to supply heat from renewable sources. This is a growing market opportunity for Scottish energy suppliers and construction businesses and a platform for the provision of a range of innovative new technologies.

vi. **Sustainable land use.** Sustainable land use is the bedrock of any credible plan for a low carbon transition. We recognise the centrality of responsible stewardship of our natural resources to the future growth of the economy and to protect Scotland’s resource base to benefit future generations.

3.3.5 Our commitments in the Low Carbon Economic Strategy support this draft RPP2. Work is already underway to take forward these commitments to:

- ensure our policies support low carbon investment - focusing on the development of financial models and products that promote and de-risk low carbon technology investments. These include the Renewable
Energy Investment Fund (REIF)\textsuperscript{45}, a multi-million pound fund to stimulate greater levels of private finance investment in green power and renewable district heating projects;

- press the UK and the EU on path-dependent policy areas such as the UK Electricity Market Reform\textsuperscript{46} and the EU energy and climate change targets and scenarios, as well as ensuring that we maximise the economic and investment opportunities for Scotland from the UK Green Investment Bank (GIB)\textsuperscript{47} and the UK Government’s ‘Green Deal’ package\textsuperscript{48} for householders and businesses.

- further develop our international profile to secure investment and promote our low carbon exporters;

- assist organisations to be ‘programme and project ready’ as investors increasingly turn to Scotland looking for opportunities;

- work with a range of public, third sector organisations and investors to enable innovative funding models that reduce emissions and dependency on fossil fuel, and also provide revenues to communities, households and investors; and

- refresh the Climate Challenge Fund with a focus on reaching ‘disadvantaged’ and ‘hard to reach’ communities, to ensure that climate justice is delivered to those most vulnerable to the detrimental impacts of climate change, and deliver Manifesto commitments to allow revenue raising and engage young people in climate change action.


\textsuperscript{46} DECC. UK Electricity Market Reform: www.decc.gov.uk/en/content/cms/meeting_energy/markets/electricity/electricity.aspx

\textsuperscript{47} BIS. UK Green Investment Bank: www.bis.gov.uk/greeninvestmentbank

\textsuperscript{48} DECC. Green Deal: www.decc.gov.uk/en/content/cms/tackling/green_deal/green_deal.aspx
UK Energy Efficiency Strategy

The energy efficiency sector in the UK accounts for about 136,000 jobs and had sales of £17.6 billion in 2010-11. UK sales have grown by over 4% per year since 2007-08, and are projected to grow by around 5% per year between 2010-11 and 2014-15. However, we believe there is more potential in the market.

The UK Energy Efficiency Strategy estimates that through socially cost-effective investment in energy efficiency we could be saving 196 TWh in 2020, equivalent to 22 power stations. Were all this potential to be realised, final energy consumption in 2020 could be 11% lower than the business as usual baseline. This potential can be found across the UK economy and realising this could have significant benefits for businesses and households in Scotland. The promotion of energy efficiency is devolved and Scotland has its own target to reduce final energy consumption by 12% in absolute terms against a baseline averaged over the years 2005 to 2007 by 2020.

3.4 Funding and financing the climate change targets

3.4.1 This report covers a period which extends beyond the Budget for 2013-14 and which will encompass future sessions of the Scottish Parliament. Budget provisions for 2013-14 and plans for 2014-15 relevant to RPP1 and the delivery of the policies and proposals in this report are laid out in a document provided to Scottish Parliament committees and the Scottish Parliamentary Information Centre. We have also published it on our website.\(^50\)

3.4.2 A major consideration in meeting both medium and long term climate change targets across sectors is how interventions and activities might be funded and financed. This section considers this at a practical level – drawing closely on mechanisms outlined in our Infrastructure Investment Plan 2011.\(^51\) Funding mechanisms which result in direct emissions abatement are detailed further in their respective sectoral chapters.

3.4.3 Taking action on climate change, specifically in reducing energy consumption, can result in direct cost savings. This is important not only for businesses tackling their bottom lines, but also for the public sector in reducing costs to release funding for other priorities and or in making savings for tax payers. Key principles that underline our approach to funding and financing activities to support the climate change targets are:

- cost effectiveness;
- consideration of whole life cycle costs;
- preventative spend and 'spend to save';
- efficiency; and
- maximising wider economic benefits.

3.4.4 Governments will always have to prioritise limited funding and make tough decisions. However, when choosing to allocate funding to greenhouse gas abatement measures, there are choices. How these choices are made will depend on the type of policy or project under consideration.

3.4.5 Policies and projects require different types of funding, depending on their nature, timing and context. Capital funding is the most common method of financing public sector infrastructure projects. Many interventions involving behaviour change require revenue funding. And as

\(^50\) Climate Change Funding Document: www.scotland.gov.uk/Topics/Environment/climatechange/climatechangefundingdocument

\(^51\) Infrastructure Investment Plan, 2011: www.scotland.gov.uk/Publications/2011/12/05141922/0
the influencing behaviour section later in this chapter illustrates, supporting infrastructure may also be necessary, and so both capital and revenue funding are required in some cases.

**Fuel Efficient Driving**

Fuel efficient driving, (sometimes known as eco-driving) advice and training is currently provided on our behalf by the Energy Saving Trust. Fuel efficient driving can significantly reduce fuel consumption and emissions. In the coming years, we will continue to promote driver training, to public sector organisations, businesses and individuals as well as promoting telematics applications to bed-in the new driving behaviours.

The business case for more efficient driving is considerable. Fuel savings of up to 10% means the costs of training and telematics are recoverable within a short period. By the end of the decade we would expect to see a mature commercial approach to training provision as is already the case for the freight transport sector.

3.4.6 Significant elements of this draft RPP2 are capital intensive. Many lower carbon goods, for example electric vehicles or new energy efficient buildings, often have higher up front capital costs but lower long term running costs than their higher carbon counterparts. In many cases this requires us to think differently about how we fund and finance low carbon infrastructure and services.

3.4.7 A critical requirement of making the transition to a low carbon economy and society, therefore, is for organisations and businesses to be able to draw on a range of funding, financing and investment mechanisms at local, national and international levels. The Scottish Government’s role is to create, support and or draw attention to these mechanisms, as well as helping build capacity in other organisations to draw down on opportunities – for example with European funding.

3.4.8 As the Scottish Government is currently facing a severe fall in the level of traditional capital funding available, a 25.9 %real-terms reduction between 2010-11 and 2014-15, alternative financing models, such as the Non Profit Distributing (NPD), Regulatory Asset Base (RAB), Tax Incremental Financing (TIF) and the National Housing Trust (NHT) are being taken forward to maximise our infrastructure investment programme.
3.4.9 We are thus increasingly turning to innovative ways of funding investments, using the Scottish Government’s own funding to unlock other funding streams. The following non exhaustive list illustrates the types of opportunities that may be available in the future for emission abating infrastructure, services, research and development, and business support.

The Scottish Low Carbon Investment Conference

The Scottish Low Carbon Investment Conference has taken place in Edinburgh each year since 2010. The conference is a leading international forum for emerging renewable energy and other low carbon innovation. Senior politicians, financiers and industry chiefs, as well as developers, practitioners, academics and policy makers from around the world, gather to debate and explore the global transition to low carbon economies and examine the role of the key sectors in scaling up investment.

Scotland, with its heritage of expertise in finance and technology and abundance of natural resources, is uniquely placed to make a significant contribution to the innovation needed in both fields to progress the global shift to low carbon. The role of government is recognised as key amongst the support architecture for green growth. The Scottish Government has committed to working with all stakeholders to ensure public sector intervention is targeted at the right areas to engender investor confidence and deliver a strong low carbon market. The conference is, therefore, an important forum for reaffirming that commitment and developing new and existing relationships.

A central theme of the conference objectives is that progress will be better achieved if the key sectors work together. The challenges are not isolated but common to the global economy. Energy security and climate change, the need to shift from finite resources to a sustainable footing for our energy needs, the technological hurdles that entails, and the need to find new investment instruments to support the low carbon sector, provide ample questions for the conference to consider.

3.4.10 The Green Investment Bank (GIB) is headquartered in Edinburgh. Over the Spending Review period to 2015-16, it will focus on:

- offshore wind power generation;
- commercial and industrial waste processing and recycling;
- energy from waste generation;

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52 BIS. Green Investment Bank: [www.bis.gov.uk/greeninvestmentbank](http://www.bis.gov.uk/greeninvestmentbank)
• non domestic energy efficiency; and
• supporting the Green Deal.

3.4.11 The GIB will offer a broad range of products tailored to the needs of different sectors. The initial product mix is envisaged to consist of equity and debt instruments. Five potential products have been identified so far that include equity co-investment, upfront refinancing commitment and subordinated debt during the operational phases. This latter product is designed to improve a project’s risk profile for institutional investors to a level commensurate with their risk appetite.

3.4.12 To date, the Scottish Government has concentrated on two priorities: the formation of a long list of projects from across Scotland that fit the criteria for GIB involvement; and the development of a liaison or interface with the GIB to develop projects and then direct and assist the transition of those projects in the investment and funding markets.

3.4.13 The GIB is now looking to secure involvement in a range of projects in Scotland and is keen to join forces in unlocking projects across its key sectors as well as those of a larger more strategic nature. This may typically involve assisting a wider team, across a number of local authorities, to work together to create a common direction and secure project investment from GIB and other funds, in the public and private sectors.

3.4.14 The Green Deal is a new UK wide finance mechanism funded by private capital. It will enable households and occupants of other buildings to have energy efficiency improvements installed at no upfront capital cost and to pay for them, over a period of years, through a charge on their electricity bill. More detail on the Green Deal can be found in section 5.4.

3.4.15 Traditional capital finance is the most common method of financing public sector infrastructure projects. Development and construction costs are paid from capital budgets at the time of building the asset. In general it ensures lowest cost of finance for a project. Examples of capital-funded infrastructure include cycling infrastructure, renewable projects, energy assistance within the housing sector and estate maintenance.
3.4.16 The Scottish Government uses **capital and revenue grants** to good effect, often levering or matching significant funding from the private sector or other areas such as Lottery funding. Examples of grants include those used in our Green Bus Fund.\footnote{Transport Scotland. Scottish Green Bus Fund: \url{www.transportscotland.gov.uk/public-transport/Buses/Bus-Fund}}

3.4.17 The Scottish Government does not yet have flexibility to borrow under the current public finance framework. The limited **capital borrowing** powers enabled by the Scotland Act mean that for the purposes of capital investment, the Scottish Government will, from 2015-2016, be able to borrow up to 10% (approximately £250 million) of the capital budget each year with a cumulative limit of £2.2 billion. Capital borrowing will be one way of funding low carbon infrastructure.

3.4.18 Local Authorities have powers to borrow under the **prudential borrowing regime**. In 2010-11, around £1.1 billion of capital spend was supported by LA borrowing. Local Authorities are using this funding arrangement for activities that include emission abatement as well as saving money. Fife Council, for example, has a rolling programme to replace its inefficient street lighting with a more efficient system. The payback period is relatively short and Fife is not only reducing its emissions but also reducing its liabilities under the Carbon Reduction Commitment (CRC) scheme.

3.4.19 The **Regulatory Asset Base (RAB)** is a well-used method of funding infrastructure within the rail industry. Transport Scotland works directly with the Office of Rail Regulation and Network Rail to agree on major new investment. Projects are financed by borrowing undertaken by Network Rail. The Scottish Government then makes regular contractual repayments to Network Rail. Examples of rail infrastructure being financed in this way are the Edinburgh Glasgow Improvement Programme and Borders Railway.

3.4.20 **Tax Incremental Financing (TIF)** is used to fund public sector infrastructure needed to unlock regeneration in an area, and which might otherwise be unaffordable to local authorities. TIF allows local authorities to keep locally generated, incremental non-domestic rate revenue (NDR) from economic activity that has arisen as a direct result of their investment in “unlocking” infrastructure. The captured revenue is then used to repay the local authority’s debt raised to finance the infrastructure investment.
### Tax Incremental Financing

One of the six TIF pilot projects under development is from Fife Council. The project involves a £17 million investment in infrastructure to improve vehicle and marine access to Energy Park Fife, remediate the site and enhance delivery of a Levenmouth Low Carbon Investment Park. It is estimated that 1000 new jobs will be created.

3.4.21 The Scottish Government uses loan funds to facilitate investment by others, where the market is failing to provide businesses and communities with access to finance. For example, the Energy Saving Trust has Scottish Government funding for a District Heating Loan Fund, helping communities to replace traditional heating with low carbon and renewable heat.

3.4.22 Access to finance is often cited as a barrier to energy efficiency or renewables uptake. The Scottish Energy Saving Scotland Small Business Loans Scheme\(^\text{54}\), provides loans of up to £10,000 through the Energy Saving Trust for the installation of technologies that reduce energy consumption in SMEs (small and medium sized enterprises). The loans are interest free for energy efficiency measures.

3.4.23 Our Central Energy Efficiency Fund (CEEF)\(^\text{55}\) provides funding for local government, NHS Scotland and Scottish Water to reduce energy consumption and carbon emissions. Projects must pay back within seven years for energy efficiency or ten years for renewable measures. Savings are repaid into the fund up to the original loan amount. Further savings may be used for frontline services or more carbon reducing measures.

3.4.24 Our Salix Finance loans scheme provides a public sector revolving loans fund for publically funded autonomous institutions such as universities and colleges as well as the emergency services to implement of energy efficiency measures.\(^\text{56}\)

3.4.25 The Scottish Futures Trust (SFT),\(^\text{57}\) a company established by the Scottish Government, has responsibility to deliver value for money across all public infrastructure investment. SFT works closely with public sector

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\(^{55}\) Central Energy Efficiency Fund: [www.energy-efficiency.org/ceef/CCC_FirstPage.jsp](http://www.energy-efficiency.org/ceef/CCC_FirstPage.jsp)

\(^{56}\) Salix Finance: [www.salixfinance.co.uk/](http://www.salixfinance.co.uk/)

\(^{57}\) Scottish Futures Trust: [www.scottishfuturestrust.org.uk](http://www.scottishfuturestrust.org.uk)
bodies to deliver infrastructure investment, including Scotland’s Schools for the Future, the Non Profit Distributing programme, Asset Management and the Scotland-wide Hub programme.

3.4.26 In relation to the low carbon and energy efficiency agenda, SFT is engaging in a number of areas and activities that have the potential to significantly increase the investment from UK wide initiatives such as the Green Deal and the Green Investment Bank; lever in additional funding to support low carbon projects; and identify potential energy efficiency projects which may be taken forward as ‘Spend to Save’ schemes such as street lighting.

3.4.27 **Non Profit Distributing** (NPD) involves a partnership with a private sector provider, who finances, constructs and maintains an asset. The public sector then pays an annual charge over a 25-30 year period to the private sector from the revenue budget once the asset has been built. The Scottish Government supports the use of NPD to deliver revenue financed investment. NPD seeks to transfer risk and exert private sector discipline during the construction phase of a project and throughout its lifetime, but without the excessive profits associated with past Private Finance Initiative (PFI) projects.

**Street lighting**

SFT is developing pilot projects to establish the potential financial and carbon savings that could be captured in street lighting through the introduction of modern technology in more efficient lamps and central management systems such as LED lighting. SFT is working with two Scottish local authorities to assess the potential of this, develop a financial business case and a toolkit to assist councils. These will be further trialled with the Scottish Cities Alliance.

3.4.28 In 2010, the Scottish Government announced a pipeline of NPD projects with a value of £2.5 billion across public services in transport, education and health. This is one of the largest investment programmes of its kind in Europe. High-quality sustainable design is supported by SFT at all stages of procurement and through to delivery.
City of Glasgow College

Environmental sustainability is a key feature of the City of Glasgow College's technical requirements for its New Campus Non Profit Distributing Project. The College is looking for a design that meets certain minimum sustainability targets, including in relation to BREEAM and Energy Performance Certificate ratings, carbon emissions and low/zero carbon technologies. The College will be using a Low Carbon Assessment tool to review and evaluate all aspects of bidders' sustainability proposals.

3.4.29 **Hub**[^58] is a Scotland-wide initiative delivering new community infrastructure that is expected to be valued at more than £2 billion over the next ten years. It brings together community planning partners, including health boards, local authorities, police, and fire and rescue services, and private sector development partners, to deliver sustainable community infrastructure collaboratively.

3.4.30 The **Scottish Investment Bank** (SIB)[^59] supports the development of Scotland’s private sector SME funding market to ensure both early stage and established businesses with growth and export potential have adequate access to growth capital. SIB operates a suite of investment funds. The three equity funds adopt a co-investment and shared risk intervention model to encourage more private investors to invest in early stage Scottish companies with high growth potential. SIB is also the lead investor in the privately managed Scottish Loan Fund which operates on a fully commercial basis and is aimed at established companies.

Haddington Infant School and St Mary’s Primary School

The new, joint school building benefits from natural lighting and includes a ‘breathing wall’ construction for good indoor air quality, solar-thermal water preheating and photovoltaic panels, while smart lighting controls are used to enhance energy efficiency. The joint facility was designed to achieve an Energy Performance Certificate A rating and delivers lower energy bills against each set of guidance from the Chartered Institution of Building Services Engineers and the Carbon Trust.

The school grounds are a resource for ecology teaching and recycling as well as recreation.

3.4.31 Scottish Enterprise has a range of innovation and research and development grants. These are available to businesses of all sizes for research and development, co-investment and technological innovations. Scottish Enterprise provides guidance on the most appropriate grant for businesses and supports them throughout the application process.

Low Carbon Funding Landscape Navigator

The UK launched a low carbon funding landscape navigator in 2012 to help providers of and applicants for low carbon funding link up more easily. Available on the Low Carbon Funding Landscape Navigator website, the navigator has been developed by the Energy Generation & Supply Knowledge Transfer Network with support from UK DECC. Users can search for funding opportunities and get help in finding partners to build collaborations for specific calls. Both public and private funders can add and manage their own funding opportunities. The navigator is a resource for the entire low carbon energy R&D community. It will be particularly valuable to smaller technology companies who struggle to keep up to speed with the myriad of support mechanisms.

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62 The Chartered Institution of Building Services Engineers Technical Guidance: www.cibseknowledgeportal.co.uk/cibse-guides
63 The Carbon Trust Scotland: www.carbontrust.com/client-services/scotland
65 Knowledge Transfer Network. Low Carbon Funding Landscape Navigator: www.lowcarbonfunding.org.uk
3.4.32 **European Structural Funds:** In the 2007-2013 programming period we have supported projects through targeted low carbon themed application calls and this has added valuable extra resources to individual projects. RPP2 related projects have included energy efficiency in social housing in Orkney. However, continuing this approach would mean that we miss an opportunity to combine Structural Funds with rural and fisheries funding streams in order to leverage additional resources from the private sector and centrally managed funds (e.g. Connecting Europe. Horizon 2020).

3.4.33 We want to identify low carbon as a priority from the outset of the new programme and to allocate a significant funding envelope. This strategic approach will help us to establish a combination of grant and financial engineering instruments that match our ambitions.

**Tayeco Ltd**

Based in South Queensferry, Tayeco Ltd has received more than £900,000 from SIB's Scottish Co-investment Fund. The company has developed *Ewgeco* - the world's first real-time energy monitor for homes and business. *Ewgeco* provides users with a better understanding of their energy consumption patterns and encourages behavioural changes through precise and instant information on electricity, water and gas at any point in time.

3.4.34 The Scottish delegation was given useful advice on securing international finance in meetings at UNFCCC Doha with the financial and business sector, including the European Investment Bank and Global Scots in Qatar. Many European cities have accessed European Investment Bank funding for green initiatives, particularly in transport. A wide range of green projects could be eligible for loan funding as long as they represent a bankable proposition in terms of returns; the Scottish Government and some large Scottish local authorities would be big enough to act as guarantors (or alternatively a pool of smaller local authorities).

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3.4.35 To support the delivery of regeneration projects in Scotland, we developed the **Scottish Partnership for Regeneration in Urban Centres (SPRUCE)** and the £50 million JESSICA investment fund which includes up to £15 million for energy efficiency retrofit projects in eligible local authority areas. Schemes that pilot or demonstrate new or innovative approaches to energy efficiency retrofit measures, including the retrofit of existing social housing stock, are eligible for this element.

### 3.5 Understanding and influencing behaviour

3.5.1 This section of the document considers the important role of understanding and influencing behaviour in meeting our climate change targets. The Scottish Government is committed to supporting the policies and proposals in this draft RPP2 with a broad spectrum of behaviour-related programmes and initiatives. These are outlined in our new *Low Carbon Scotland: Behaviours Framework* which sets out our strategic approach to encourage low carbon lifestyles amongst Scotland’s individuals and households. The Framework draws on the latest behaviour change research and builds on the work achieved through the earlier *Low Carbon Scotland: Public Engagement Strategy* published in 2010. It will be published while this draft RPP2 is being considered by the Scottish Parliament.

3.5.2 The way we use electricity, the way we travel, the way we heat our homes and other buildings, the products we purchase, the way we run our businesses and organisations, the way our goods are transported – all of these have emissions consequences. These emissions stem from the choices we make, the fuels and technologies that we use and the way in which we use them, i.e. our behaviours. Understanding how and why we make decisions is central to meeting our climate change targets.

3.5.3 Reducing emissions is challenging, but as Scotland’s population and number of households increases this challenge becomes greater still. Scotland’s population has seen a continuous increase in recent years, partly because there have been more births than deaths, but mainly because more people have moved to Scotland than have left. This trend continued in 2011, with migration largely responsible for an increase of

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68 The Scottish Partnership for Regeneration in Urban Centres: [www.ambergreenspruce.co.uk/](http://www.ambergreenspruce.co.uk/)


0.6% in the population from 2010. At 5,295,000 the population is now the highest ever recorded, with a projected increase to 5.76 million by 2035.71

3.5.4 The Scottish Government is working hard to increase sustainable economic growth by promoting Scotland as a positive place to live, work, learn and remain. Should the trend in population increase continue, Scotland will be on track to exceed the population growth target established in our Government Economic Strategy. Scotland has a large established migrant community and we welcome the contribution new Scots are making to our economy and society. However, all things being equal, these increases would likely mean still greater energy demands, and higher emissions from transport and waste impacting on overall emissions.

3.5.5 There is no magic bullet for changing the way we produce and use energy, and manage our land. But clearly, policy and engagement programmes have a key role to play in influencing how society organises itself and what choices people are able to make. New and carefully planned infrastructure, innovative services and technologies, effective communications, and community and business engagement can do more to help us live more sustainably as a society, particularly where these are consistent and joined up.

**Young People**

Enhancing young people’s skills and creative thinking will be key to their future prospects in a changing world. Scotland is seen as one of the world leaders in the Eco-Schools movement,72 with around 3,700 schools participating in the programme (98% of local authority schools). In total, over 1,300 schools currently hold a Green Flag. The inclusive, whole-school nature of the Eco-Schools programme helps to raise awareness of environmental and sustainable development issues with young people, through its strong links with Curriculum for Excellence.

3.5.6 In other words, to address these challenges there is a need to influence individuals and what drives our choices and behaviours, such as our attitudes, beliefs, habits and values. The social context in which we operate is also important, i.e. what other people do and see as appropriate and desirable behaviour has an impact on how each of us act. Finally, the material context – infrastructure and technologies, legislative and policy

71 Scotland’s greenhouse gas emission reduction targets do not change with changing demographics.
72 Eco-Schools Scotland: [www.ecoschoolsscotland.org/](http://www.ecoschoolsscotland.org/)
frameworks – can either work to promote or constrain low carbon choices and behaviours which is why they feature strongly in this draft RPP2.

3.5.7 We need to be clear about which individual and household actions are key to tackling climate change. In 2010, Scottish Government research identified where household actions would make the biggest impact on reducing energy demand and contribute to the achievement of Scotland’s climate change targets. These ten key behaviours (Table 3.1 below) are intended to inform our analysis and understanding of what Government and others can do to enable, encourage and exemplify change. Furthermore, these key behaviour areas have a clear read across to many of the policies and proposals contained within this report. They are outlined in the table below and further information can be found at the website.73

<table>
<thead>
<tr>
<th>Table 3.1. Ten Key Household Behaviours</th>
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</thead>
<tbody>
<tr>
<td><strong>Home Energy</strong></td>
</tr>
<tr>
<td>Installing a more efficient energy system</td>
</tr>
<tr>
<td>Keeping the heat in (draught proofing &amp; insulation)</td>
</tr>
<tr>
<td>Better heating management</td>
</tr>
<tr>
<td>Saving electricity</td>
</tr>
<tr>
<td><strong>Travel</strong></td>
</tr>
<tr>
<td>Walking, cycling, using public transport and/or car sharing instead of (solo) driving</td>
</tr>
<tr>
<td>Using a low carbon vehicle, fuel efficient driving</td>
</tr>
<tr>
<td>Using alternatives to flying where practical</td>
</tr>
<tr>
<td><strong>Food</strong></td>
</tr>
<tr>
<td>Avoiding food waste</td>
</tr>
<tr>
<td>Eating a healthy diet high in fruit and vegetables, in season where we live</td>
</tr>
<tr>
<td><strong>Consumption</strong></td>
</tr>
<tr>
<td>Reducing and reusing, in addition to the efforts we already make on recycling</td>
</tr>
</tbody>
</table>

3.5.8 For example, Chapter 5 outlines the policies and proposals that will help us to install more efficient energy systems and maintain heat. Chapter 7 describes how we propose to help people make more carbon friendly travel choices, whilst the waste and resource efficiency chapter describes steps that will help households reduce and reuse, as well expand on the efforts that many households already make on recycling.

3.5.9 Research also offers important insights on how to most effectively influence people’s behaviours. The following section sets out ten insights about influencing behaviours and decision making which should be regarded as underpinning principles for policy development that remain

relevant over time. While they are written in the context of policy development for the Scottish Government, they are important for **all organisations and groups** considering how to best influence behaviour. They are evidence based, drawn from the Scottish Government’s Climate Change Behaviours Research Programme (CCBRP). Working with our partners, we will need to:

1. Show leadership
2. Be consistent
3. Build common cause
4. Make change as easy as possible
5. Ensure change is targeted and tailored
6. Use a packaged approach
7. Intervene at ‘moments of change’
8. Think about ‘use’ when rolling out new products and technology
9. Build sustainability into everyday life
10. Robustly monitor and evaluate interventions

3.5.10 **Insight 1: Show leadership** We know that the public expects Government to show leadership on climate change. Evidence suggests that there is a public appetite for action, even if this means using legislation to drive change forward. At the same time, public, private and third sector organisations have crucial roles to play in promoting positive values and influencing behaviours.

3.5.11 It is important that Government both leads the way, and is seen to lead the way, from the setting of clear, stable and long term policy frameworks that drive ambitious emission reductions, through to transformational management of its own activities and estate. Of course, transformation will not be achieved by the Scottish Government alone, and in many cases it will be more appropriate for others to lead, not the Government.

3.5.12 **Insight 2: Consistency of message and of action is key.** Evidence suggests that Government and its partners need to be seen to be consistently low-carbon if people are to take action themselves. Policies that appear to contradict key messages undermine public belief in the seriousness of the Government’s resolve and the fairness of the measures.

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introduced. In order to address this issue in the short to medium term, the Minister for Environment and Climate Change will hold a series of local discussions with different groups to discuss issues around low carbon behaviours.

3.5.13 **Insight 3:** Any engagement work must approach tackling climate change as a **genuinely joint endeavour, with a strong values-based approach.** Engagement work needs to avoid telling people what they should do: instead, the focus needs to be on building common cause – acting together, moving towards the same goal. This will be important in winning hearts and minds, particularly as many of the choices leading up to 2027 could be, or appear to be, difficult. Genuine engagement with individuals, families, communities, businesses, and interest groups will be essential in both generating options and later buy-in to major policy decisions and implementation plans.

3.5.14 **Insight 4: Change needs to be as easy as possible.** Even change that should be straightforward - having an energy efficiency measure installed, for example - can be challenging and difficult for some people. This can deter people from making simple changes in the first place or from following up on changes they have already made. Making sure that any lower carbon action or choice is as hassle-free as possible, throughout the process, should be key to any intervention planning.

### Cool Biz, Japan

Cool Biz was a Japanese Ministry of Environment initiative that began in 2005 to reduce energy use in government buildings. Air conditioning settings were changed throughout the summer months, so that buildings would not be cooled below 28°C. To make this more comfortable for workers, a new dress code was implemented, which Government Ministers also followed, moving away from traditional business suits towards lighter clothing. The programme was a success, with the Ministry estimating a reduction of 1.14 MtCO₂e in 2006. With further energy reductions needed following the 2011 earthquake and tsunami, Super Cool Biz has now been launched with an even more flexible dress code and other measures to conserve energy in government offices. Simple interventions like this demonstrate leading by example and consistency of message or action, and also have the potential to reduce energy costs and carbon emissions significantly.⁷⁵

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Insight 5: Personalised information and individualised feedback can be key drivers. Giving people personalised information about their energy use, what their travel options are, or how efficiently they are driving is a good way to enable them to take action themselves. For example, most people are unaware of how much energy they use, what tariff they are on, and how they can reduce their personal carbon footprint. Making actual energy usage more visible (feedback) improves customer understanding and helps individuals take action as a result.

For maximum impact, information needs to be personalised, continuous and visually appealing. In the same way, finding out how our energy use compares with others in our neighbourhoods provides real-life feedback that can be an important driver of energy reductions.

Insight 6: Make change packaged. A packaged approach is often the most efficient way of delivering significant change. Personalised approaches are even more successful when they are offered as part of a package of interventions. This might mean targeting one behavioural issue with multiple approaches. Or it might mean tackling a range of issues at once. A concrete example of the latter is the ‘whole house approach’ to home energy auditing that identifies multiple energy efficiency issues in one visit and ‘sorts’ them with a follow-up package. Studies suggest this can lead to significant energy reductions compared to baseline levels and control groups, with effects seen over a number of years.

Durham, Canada

The Durham region in Canada introduced a social marketing campaign to reduce residential water use, particularly from watering gardens and lawns. Two approaches were used. One group received a “passive” information campaign that aimed to raise awareness of the problem, while the other received a community-based package of interventions to affect behaviour change including face-to-face visits, external reminder signs, pledges to water only in specific circumstances, and water gauges to test when lawns actually needed water. The results were revealing. The first approach resulted in increased lawn watering while the second led to a 54% reduction in water consumption. The initiative cost Durham $80,000 to deliver but saved them $945,000 by not having to invest in a new water processing plant.

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3.5.18 **Insight 7: Intervene at 'moments of change'.** Major life or work events offer opportunities to deliver significant shifts in lifestyles or work culture. For individuals and households, these ‘moments’ might be buying a new property, moving to a new area, getting a new job, or having a first child. Or there could be other ‘trigger points’, such as getting a new kitchen or bathroom, that provide opportunities to do other improvement work to the home.

3.5.19 For businesses or other organisations, the change might be an office relocation or reorganisation, or bringing in a major new technology or product. These moments of change offer, essentially, a new context in which to reflect on life or work arrangements. Targeting moments of change is at present an underused strategy in terms of interventions, particularly with households, but one that offers genuine potential. Travel planning is one area where some work has been done on this. And retailers are particularly sharp on maximising these kinds of opportunities.

### EAE

EAE is a leaflet distribution company based outside Edinburgh with other locations north of Aberdeen and ten 'home bases' in rural and remote areas of Scotland. The company aims to be carbon neutral by 2015. For EAE, relocating to new premises provided an opportunity for the leaflet distribution company to review its activities. Investments included the installation of showers to encourage people to cycle to work and the construction of the company’s own wind turbine - a very visual symbol of the company’s commitment to sustainability. Since its relocation, the company continues to identify new areas in which it can reduce its carbon emissions.

3.5.20 **Insight 8:** Technological advances will be key to living more sustainably in future, but how people respond to and use new products and services must be carefully considered. Any technological innovation must take behavioural implications into account if it is to maximise the potential benefit. For example, by 2019 every household in Scotland should have a smart meter. However, smart meters can deliver variable savings depending on how they are used, so to maximise these savings, the quality of the information and support given at the point of installation and the opportunity to obtain subsequent advice is crucial. Service providers will

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need the appropriate skills to be able to advise households appropriately. Energy-saving light bulbs are a good example of a new technology that has not yet led to significant energy savings, because of how they are used (see box below).

**Light-bulbs**

A reduction in sales of standard bulbs and the promotion of new energy efficient alternatives has led to total energy consumption from lighting beginning to decline (see top line in the chart below). However, the total savings are less than expected, bearing in mind the energy savings made from fewer standard bulbs (compare the top two lines in the chart). These savings have been partly offset by increasing energy consumption from other types of bulb.

![Figure 2.1. Total electricity consumption by household domestic appliances 1970 to 2009](image)


In the case of lighting, while purchasing behaviours may have been changed (success), environmental impacts have not been significantly reduced (failure). Emerging tastes for ambient low-lighting have resulted in many more light bulbs per room in European countries than in the past. So, for example, one standard bulb may be replaced by multiple bulbs, which may individually be more energy efficient but the total amount of energy consumed for lighting may not ultimately be very different.

In short, behavioural outcomes may not be achieved simply by introducing sustainable substitute products. How these products are used by people in real life contexts needs to be carefully considered and influenced.  

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3.5.21 **Insight 9: Build sustainability into everyday life.** The more that sustainable behaviours are built into the fabric of everyday life, the more likely it is that people will behave sustainably. People don’t ‘behave’ in isolation: we develop preferences, habits and lifestyles over time, and in wider contexts. So, while a series of sensible interventions targeting individuals might bring about some limited change, ‘individual-based action’ won’t on its own bring about a low-carbon society. Broader, longer-lasting, societal change requires a more ambitious approach.

The Review of the Climate Challenge Fund

The *Review of the Climate Challenge Fund*\(^8^0\) found that community-led energy audits encourage people to install insulation and other physical (‘hard’) measures. This is particularly the case where the auditor “hand-holds” the participant through the installation process, making it easy for them. This approach overcomes many of the barriers around confusion, hassle and lack of knowledge, by clarifying the process for the participant and taking much of the effort away. A key element of hand-holding involves helping people access grants and subsidies. Where projects have been able to signpost people to financial assistance, this has helped to overcome the cost barrier.

3.5.22 This means influencing individuals where possible, but also focusing on building social norms – in other words, what’s seen as normal and everyday behaviour - and providing infrastructure that is easy to use and services that offer genuine help and support. Recycling is a good example of a sustainable behaviour that is built into everyday life. Ideally, every intervention would involve consideration of how it can work on individual, social, and material (i.e. infrastructure) levels.

3.5.23 **Insight 10: Monitor and evaluate interventions.** Without robust monitoring and evaluation, it is difficult to know whether interventions have been successful, or how they could be improved. Even hard measures, like insulation programmes, can benefit from evaluation: of course, simply installing insulation will, for most, reduce their overall energy consumption. But households may react to lower bills by being less concerned to monitor their energy use. Or they may not make the energy savings they could have made, just because they haven’t had tailored advice. Or they may simply feel dissatisfied because of the service they received, which could put them off future programmes. Every programme taken forward with carbon

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implications would benefit from robust monitoring and evaluation to maximise savings and to learn lessons for the future.

3.5.24 In summary, our successful long term strategy to influence behaviours around climate change will work beyond the individual, to look at broader social and infrastructural contexts, and about how new products are actually used in practice. It will be based on leadership and values-based engagement, especially about the difficult choices ahead. We will work to make change as easy as it can be, and personalise and tailor interventions where it makes sense to do so.

### Recycling

Recycling has become established in Scotland largely because, for most, it’s built into the fabric of the everyday. The infrastructure is provided on-street, with reliable services scheduled into the week. Different bins are provided for different products, with an expectation that people will sort the different products themselves, and the bins are then collected.

This kind of infrastructure and support has made recycling a social norm regardless of whether people are environmentally engaged or not. The service provides a visible sign of its importance. However, significant marketing efforts have played a key role in encouraging people to join in on the collective effort.

Future plans, such as ‘recycling on the go’ – providing recycling facilities for separating plastic, paper, and other materials on the streets of our towns and cities – will further reinforce recycling as normal and everyday.

3.5.25 We will monitor and evaluate our programmes and learn lessons from the wider evidence base, including the work of others. This is so that we can be clear about how such programmes are making an impact and reducing emissions, and where and how improvements might be made. And finally, we will continue to recognise that the people of Scotland are at the heart of our climate change ambitions. While the transformation to a low carbon Scotland will involve significant technological change, that change will only occur successfully through the decisions and behaviours of all of us at individual and organisational levels.
3.6 The role of the planning system

3.6.1 The final aspect in this section is the planning system, used to make decisions about the future development and use of land in our towns, cities and countryside. It considers where development should happen, where it should not and how development affects its surroundings. The system balances competing demands to make sure that land is used and developed in the long-term public interest.

3.6.2 The planning system has an important role in promoting sustainable development and can help us adapt to climate change and mitigate its effects. Planning will support emissions reduction in sectors such as energy, transport, heat, and waste and is often a critical enabling measure.

The role of Government

Government can help the development of carbon capture and storage and the expansion of renewables, renewable heat and district heating by maintaining a supportive planning system. The current Second National Planning Framework (NPF2) sets out a spatial strategy for Scotland's development to 2030 taking forward the spatial aspects of the Scottish Governments policy commitments on climate change, sustainable economic growth and renewable energy.

3.6.3 The National Planning Framework, Scottish Planning Policy, planning advice, and strategic and local development plans will all play their parts in supporting the transition to a low carbon future. Planning authorities review their development plans on a five year cycle. Development plans prepared after the publication of this second Report on Policies and Proposals are expected to include policies which will support the transformative change required to meet our climate change targets. Activities within the planning system include:

- The transition to a low carbon economy has been identified as a key theme for the third National Planning Framework (NPF3), which will be published in 2014;

- The Spatial Planning Assessment for Climate Emissions (SPACE) tool\(^\text{81}\) will ensure that the implications for greenhouse gas emissions of alternative spatial planning options are factored into decision making;

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\(^\text{81}\) Spatial Planning Assessment of Climate Emissions: [www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/sus-dev/SPACE](http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/sus-dev/SPACE)
• The expansion of renewable energy generating capacity is strongly supported by national planning policy;

• Sustainable and active travel are promoted by Scottish Planning Policy and the National Planning Framework;

• We are supporting planning authority work on heat mapping to inform future strategic and local policy on the development of heat networks; and

• Scottish Planning Policy provides clear guidance on development and flood risk.

3.6.4 We are currently reviewing Scottish Planning Policy and revising the National Planning Framework. We will consider how national planning policy can further assist in delivering emissions reduction in support of our annual targets. The reduction of emissions will continue to be a major consideration in the planning system’s promotion of sustainable places.
4. Energy

The way we produce and use energy is central to tackling climate change and creating a low carbon economy.

4.1 Our ambitions for decarbonising Scotland’s energy supply

4.1.1 Our aim is to achieve secure, affordable and low carbon energy supplies for the long term by both reducing our demand for energy and decarbonising the means by which that energy is produced. We will also develop our role as a supplier of low carbon energy to our neighbours.

4.1.2 The first Report on Policies and Proposals (RPP1) indicated that Scotland aims to reduce the demand for energy and decarbonise its energy supply in order to provide secure and low carbon energy supply for the long term. It outlined that dramatic progress had already been made in harnessing Scotland's vast potential for renewable electricity generation. The case for change remains as strong as ever, and the progress being made has continued over the last two years.

4.1.3 Our 2020 energy targets set out our aim to make significant progress toward decarbonisation by 2020 (in line with those of the EU):

- meet at least 30% overall energy demand from renewables by 2020;
- reduce total final energy demand in Scotland by 12% by 2020, covering all fuels and sectors;
- source 11% of heat demand and 10% of transport fuels from renewables by 2020;
- delivering the equivalent of at least 100% of gross electricity consumption from renewables by 2020 with an interim target of the equivalent of 50% of gross electricity consumption from renewables by 2015;
- enable local and community ownership of at least 500 MW of renewable energy by 2020;
- demonstrate carbon capture and storage (CCS) at commercial scale in Scotland by 2020 with full retrofit across conventional power stations thereafter by 2025-30; and
• seek transmission system upgrades and increased interconnection capable of supporting the projected growth in renewable capacity.

4.1.1 Emissions from energy cut across several sectors of the Scottish economy, i.e. transport fuels, space heating and industrial processes, not just the energy supply sector itself. In this section we focus primarily on decarbonising Scotland’s electricity supply. Other sources of energy are covered elsewhere, e.g., domestic heat demand and supply is discussed in Chapter 5: Homes and Communities.

4.2 Our ambitions for decarbonising Scotland’s electricity supply

4.2.1 Our policy on electricity generation was set out in the draft Electricity Generation Policy Statement (EGPS), published in March 2012. The Statement said that Scotland’s generation mix should deliver:

• a secure source of electricity supply;
• at an affordable cost to consumers;
• which can be largely decarbonised by 2030; and
• which achieves the greatest possible economic benefit and competitive advantage for Scotland including opportunities for community ownership and community benefits.

4.2.2 Renewable energy is that which comes from natural resources such as sunlight, rain, wind, tides and waves. They are renewable because they are naturally replenished. Deploying renewables in Scotland will enhance security of supply, minimise consumer exposure to volatile and rising fossil fuel prices and deliver obvious economic benefits to Scotland. Use of renewables will also lead to decarbonisation of the supply to the electricity grid and provide greater scope for the deployment of electrified heating and transportation systems in the future.

4.2.3 Our ambitions for renewables and the delivery of clean electricity in Scotland go beyond our current 2020 targets. We have therefore set a 2030 decarbonisation target, in line with the Committee on Climate Change’s recommendations for the UK Government. This target is non-statutory, but will be used to guide our overall policy approach and will set the context for planning decisions under Section 36 of the Electricity Act going forward.

4.2.4  The **decarbonisation target will be to achieve 50 gCO₂/kWh of electricity generation in Scotland**. We are confident that we will be able to achieve it, and our central scenario of future electricity generation means that we will be able to meet the target well ahead of 2030. The CCC has provided advice to us on the downward path of emissions from the electricity industry from 2010 through to 2030. It is likely that we will be able to meet the downward path in the longer term and make progress in the early years, especially before the closure of coal generation stations due in the years ahead and the further build-up of renewable supply.

4.2.5  The decisions which will be made over the next few years will determine whether we will be able to achieve our ambition. The majority of electricity used in Scotland in 2010 was generated by plant which had been commissioned around 20 years earlier, and a sizeable minority by plants over 30 years old. So it will be in the future that long-lived generation assets will determine our future fuel mix.

## Progress towards decarbonisation of electricity supply

Our aim is to ensure that we have a largely decarbonised electricity system by 2030. **Our 2030 decarbonisation target will be to achieve a carbon intensity of 50 gCO₂/kWh of electricity generation in Scotland.**

The Climate Change (Scotland) Act requires a report to the Scottish Parliament on the Carbon Intensity of the Electricity Supply System in Scotland. The Carbon Intensity of the grid (including estimates of emissions from backup and balancing services) was officially reported to be 347 gCO₂/kWh in 2010 but is estimated to have fallen to 291 gCO₂/kWh in 2011 using the same methodology. We propose to use the same indicator to measure progress toward our decarbonisation target. This target therefore represents an 83% reduction in carbon intensity between 2011 and 2030.

4.2.1  We need to remain flexible on how best to deliver our target in the light of progress in the world climate change talks, integration of the EU energy market, developments in grid technology and storage, progress in cost reduction of renewables and CCS, and progress in energy efficiency and demand side management.

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83 Advice received from the CCC is available here: http://www.scotland.gov.uk/Topics/Environment/climatechange/what-is/expertadvice/advisorybody

4.2.2 At this stage, the Scottish Government, like the rest of the UK and our EU neighbours, has not set electricity targets beyond 2020 in terms of specific fuel mixes. The UK Government has committed to amending the current Draft Energy Bill to take powers to set a decarbonisation target range for 2030 in secondary legislation. A decision to exercise this power will be taken once the CCC has provided advice in 2016 on the 5th Carbon Budget which covers the corresponding period.

4.3 Where we are now

4.3.1 Scotland accounts for only around 9% of the UK's total energy consumption, but is rich in energy resources and produces a diversity of energy supply. The energy supply sector covers the production of energy, and in particular the generation of electricity, either in power stations or in large industrial process (like refining). Energy supply in Scotland produced 20.7 MtCO$_2$e of greenhouse gas emissions in 2010, which equated to 37% of Scotland’s total in 2010$^{85}$.

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Sankey Diagram showing By Source and End User GHG emissions transfers for Scotland in 2010 (Mt CO$_2$e)

The pink line from Energy Supply to End User represents emissions from energy supply in the production of fuels for international aviation and shipping. Exports equates to emissions from international aviation and shipping.

86 Source: Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2010 (Aether and AEA, AEAT/ENV/R/3314)
4.3.2 Emissions in the energy supply sector are dominated by installations within the EU ETS, with 96% of emissions in energy supply covered by these EU wide arrangements. As noted earlier in this document (section 2.7), this sector and the other emissions-intensive industries in the ETS are referred to as the traded sector.

4.3.3 Energy supply includes emissions from power generation, refineries, coalmines, solid fuel transformation, oil and gas extraction and processing, and other energy industries. Emissions from the energy supply sector (power stations, refineries, oil and gas production, and coal mining) were 20.7 MtCO$_2$e in 2010, or 39% of total Scottish greenhouse emissions. Overall, there has been a slight downward trend in energy supply emissions since the 1990s. This reflects the long lived nature of the coal generation assets, and their greater use toward the end of their working lives due an increased ability to export power to England and Wales.

4.3.4 The main source of emissions in Scotland within this sector is electricity generation at power stations, which accounts for 76.4% of energy supply emissions in 2010 (15.8 MtCO$_2$e); refinery emissions account for a further 10.4% (2.2 MtCO$_2$e) of the Energy Supply sector emissions in 2010.

4.3.5 RPP1 outlined that the Net Scottish Emissions Account (NSEA) will track the trajectory of EU ETS emissions rather than Scottish territorial emissions from power generation. This means that a large proportion of Scotland’s emissions are assumed to fall on a pre-determined trajectory, irrespective of actual emissions. In RPP1, therefore, electricity generation policies were considered as ‘enabling policies’, which, although not affecting the NSEA, were vital for the achievement of Scotland’s long term goals. The decarbonisation of the electricity sector is also a vital component of decarbonising other parts of the Scottish economy such as transport, which will become increasingly reliant on electricity.

4.3.6 In this draft RPP2, we outline the progress towards our 2020 targets, and the role that the ETS will play in reducing emissions. Beyond 2020, there is scope for significant further reductions in emissions, but there is significant uncertainty over long term policies at UK and EU level. As stated in section 2.7, from 2021 to 2027 the traded sector is presented as ‘net emissions’ resulting from estimates of future actual electricity generation emissions in Scotland and from the CCC target advice that identifies abatement from non-electricity generation traded industry.

4.3.7 Our estimates of electricity emissions beyond 2020 is realistic but ultimately projections of future emissions from the electricity generation sector are highly uncertain. A number of complex and competing factors
govern generators' hourly dispatch decisions, including relative fossil fuel prices, demand, system constraints and wind speed. Future investment decisions relating to the building, extension and closure of generating plant are also subject to this uncertainty.

4.3.8 The chart below presents emissions from a generation scenario to 2027, making credible assumptions about thermal plant build and closure dates, average annual running times and the deployment of carbon capture & storage at demonstration and/or at scale. This scenario is designed to give an indication of emissions from the sector by varying the amount of coal, gas and CCS on the system. The chart below represents the thermal generation capacity we expect to be installed under our central scenario.

Chart 4.1: Trajectory of Electricity emissions under RPP2

![](chart.png)

4.3.9 Overall our assessment is that by 2020, emissions from Scotland's electricity sector will be substantially lower than today and be broadly in line with the pathway of emissions under the ETS 30% scenario.
Our scenario beyond 2020

The chart below sets out the total installed coal and gas capacity of each scenario. The use of unabated gas plant capacity is, in part, to provide peaking plant services; this reflects the fact that the economics of CCS are unlikely to support peaking plant generation in the first instance.

- **To 2020:** the scenario assumes that Cockenzie coal fired power station closes in 2013, with Longannet coal fired station closing in 2020, consistent with industry information and the requirements of EU Directives. Peterhead gas fired power station continues to generate. 2 GW of gas capacity is assumed to come online in 2020, to coincide with the closure of Longannet. It is assumed that 500MW of CCS demonstration plant is operational by 2020.

- **To 2025:** a further 500MW of CCS is added in 2024/25 building on the experience of the earlier CCS demonstrators. **To 2027:** by 2027, a further 600 MW of gas plant adopts CCS, resulting in a total of 1600 MW of CCS gas plant by 2027, with a further 1,600 MW unabated.

- Using the emissions and an aggregate generation figure (consistent with that adopted for the Draft Electricity Generation Policy Statement) would suggest a **2030 carbon intensity figure below the CCC recommended 50 gCO₂/kWh.**

- With our greater ambition for renewables, especially offshore beyond 2020 and a possible on going role for existing nuclear generation, it is plausible that this figure could be even lower with any exported generation also helping the UK Government deliver on its own climate change ambitions and/or with increased domestic demand for electricity for use in transport and heat sectors.
4.3.10 Where the supporting narrative refers to specific plant, this is intended to provide context to the assumptions. The analysis here does not indicate any preference for particular plant, and the equivalent levels of gas, coal and CCS capacity could be delivered by a number of different combinations of generating plant.

4.3.11 The generation scenario above will benefit from the future role for (non-pumped) electricity storage at scale and increased interconnection. While still in their infancy, there are numerous electricity storage solutions currently under development across the globe. Synergies between storage and intermittent renewables can significantly reduce the need for flexible, typically unabated fossil fuel, generation capacity leading to savings for consumers as well as emissions reductions. We are working with the Institute of Mechanical Engineers in Scotland to critically assess the viability and efficacy of these storage options including their potential application across Scotland. Successful delivery of storage solutions in Scotland will help us achieve the targets, and could lead to lower levels of emissions than those set out here.

4.3.12 The analysis presented here is broadly consistent with that adopted for the draft EGPS, which includes a need for a minimum of 2.5GW of upgraded thermal capacity, with any minor variations reflecting the many uncertainties associated with the future generation mix.

4.3.13 The analysis is also being enhanced. We are investing to improve our modelling capability. A major investment in the creation of a Scottish specific dynamic dispatch model will allow for more accurate modelling of this nature in the future and will significantly enhance our analytical capacity. We anticipate the model to be in operation by summer 2013.

4.4 Decarbonisation policies - our approach

4.4.1 As described elsewhere in this chapter, decarbonisation will be achieved through a range of polices. The policies and proposals identified in this report alongside the Draft EGPS would suggest that the carbon intensity of the grid in Scotland will fall at least in line with the levels outlined by the Committee on Climate Change (CCC).

4.4.2 Our aim is to achieve decarbonisation of Scotland’s electricity supply by 2030, consistent with the recommendations of the CCC. The 2030 decarbonisation target will be to achieve a grid-average of 50 gCO$_2$/kWh of electricity generation in Scotland down from an estimated 291 gCO$_2$/kWh in 2011.
Scotlands Targets for Renewable Electricity

We are aiming for an output equivalent to 100% of Scotland's demand for electricity to be met from renewables by 2020. But this does not mean that Scotland will be 100% dependent on renewables generation; renewables will form a vital part of a wider electricity mix, supported by continuing need for a minimum of 2.5GW of upgraded clean thermal baseload. The electricity generation mix that we see as likely and necessary for Scotland is set out in our revised Draft Electricity Generation Policy Statement.

4.4.3 Alongside a substantial further growth in renewables, Scotland will maintain and build new power stations run on traditional fossil fuels. This thermal generation will form our baseload generation capacity and flexible element of our energy supplies. Our aim is that Scotland's thermal generation will be decarbonised over time through the increased application of CCS. CCS has the potential to substantially reduce emissions from fossil fuel power stations and will be a vital element of a decarbonised power sector by 2030 (see section 4.7 for more on CCS).

4.4.4 The deployment of renewable electricity and CCS in Scotland will not only help to enhance security of supply, minimise consumer exposure to volatile and rising fossil fuel prices and deliver obvious economic benefits to Scotland but will also lead to decarbonisation of Scotland’s electricity supply and provide greater scope for the deployment of electrified heating and transportation systems.

4.4.5 Within the context of an integrated GB market for electricity, Scotland has its own policies and support measures aimed at influencing electricity demand and supply. Our policies, set out in our Draft EGPS, Renewables Routemap, Offshore Wind Routemap, Carbon Capture and Storage Roadmap and the Energy Efficiency Action Plan (EEAP), will deliver substantial reductions in emissions and a substantial increase in low carbon electricity exports from Scotland by 2020, while maintaining security of supply within Scotland.

4.4.6 Those exports will increase substantially in the 2020s as Scottish-based renewable energy and low carbon electricity generators secure their position as the most competitive producers of low carbon electricity in an increasingly integrated European market.

4.4.7 The Draft EGPS examined the way in which Scotland generates electricity and considers the changes required to meet our targets. It looks at the sources from which that electricity is produced, the amount of
electricity which we use to meet our own needs, and the technological and infrastructural advances and requirements which Scotland will require over the coming decade and beyond.

**Draft Electricity Generation Policy Statement**

The Statement was published in March 2012 for consultation along with an accompanying Environmental Statement. A final version will be published in 2013. Our aim is to achieve a secure, affordable and sustainable supply of electricity, including:

- **Energy demand reduction** – detailed in our Energy Efficiency Action Plan, towards our target of a 12% reduction in total final energy consumption by 2020;

- **Renewable energy sources** – our Renewables Routemap outlines the importance of renewable sources, including our targets that 50% of Scotland’s gross electricity consumption be provided by renewables by 2015 and 100% by 2020, and our target for at least 500 MW of renewable energy (electricity and heat) to be in local and community ownership by 2020;

- **Carbon Capture and Storage (CCS)** – our policy is that renewable generation should operate alongside upgraded and more efficient thermal stations, and that there should be a particularly strong role for CCS, where Scotland has the natural advantages and resources which could enable it to become a world leader, with the central North Sea thought to be capable of storing as much as 100 MtCO₂e per year up to 2030 and 500 MtCO₂e per year beyond 2030.

- **Nuclear** – we are opposed to any new build of nuclear power stations in Scotland. The existing stations will be phased out in Scotland over time, with no new nuclear build taking place in Scotland. We have, however, consistently stated that, subject to the relevant safety cases being approved by the Office for Nuclear Regulation, we do not see that this precludes extending the operating life of Scotland’s existing nuclear stations to help maintain security of supply over the next decade while the transition to renewables and cleaner thermal generation takes place. As such, we did not oppose the life extension of Hunterston B nuclear Power Station to 2023 announced by EDF Energy in December 2012.
• **Bioenergy** - our policy is that biomass should be used in the most efficient and beneficial applications at a scale that is appropriate to make the best use of finite bioenergy supplies, i.e. in heat-only or Combined Heat and Power (CHP) applications and off gas-grid solutions. In this way, biomass can make an appropriate contribution to meeting the Scottish Government’s target of 11% of heat demand to be sourced from renewables by 2020.

• **Role of electricity storage** – we support the development of electricity storage solutions, which, while financially and technologically challenging, can help address the variability of certain forms of renewable generation.

• **Transmission and distribution** – we recognise the need for extensive new onshore and offshore grid development and reinforcement in Scotland and strengthened connections within and across the UK. The Scottish Government works closely with UK Government, Ofgem and Transmission System Owners to plan and deliver the grid upgrades needed to deliver Scotland’s future grid. As a result of this work, Ofgem is fast-tracking up to £7bn worth of grid upgrades in Scotland to boost capacity and better connect and transport Scotland’s electricity. We also continue to press for a changes to regulatory regime to accelerate deployment of our onshore and offshore resources – in particular an equitable outcome on charging.

• **Interconnection** - beyond the GB system and in Europe we are pushing the importance of developing more and better interconnection from Scotland to other parts of the UK, the Nordic countries and Europe. This includes working to deliver cross-border offshore grid connections in the seas between Scotland and Ireland, as set out in the Irish Scottish Links on Energy Study (ISLES). It includes supporting projects of interconnection to Norway and Europe and working with EU partners on developing a North Sea electricity transmission grid.

4.5 **Energy demand reduction**

4.5.1 Our ability to reduce total final energy demand in Scotland by 12% by 2020 is critical to meeting our other targets in a cost-effective way. Electricity use is likely to rise in the long term as more is used for transport and heat reasons.

4.5.2 Energy efficiency is the simplest and most cost-effective way to reduce emissions whilst seeking to maximise the efficiency of our renewable energy resources. It complements our other energy-related
strengths, and applies across housing, business, and transport - each of which are major energy consumers - to help us create a more sustainable Scotland. Energy efficiency measures relevant to particular sectors are detailed in the corresponding sectoral chapters in this document.

4.5.3 We published the Energy Efficiency Action Plan (EEAP) in 2010 and progress reports in 2011 and 2012. The EEAP established a target to reduce total final energy demand in Scotland by 12% by 2020 from a 2005-7 baseline, covering all fuels and sectors. The data for 2010 show that final energy consumption fell by 6.2% against the target baseline although showed an increase of 1.2% compared with 2009. The rise in 2010 was due in part to the economic recovery from the previous year and a particularly cold winter. However, the longer term reduction indicates that Scotland is on track to meet the 2020 final energy reduction target.

4.6 The role of renewable electricity

4.6.1 Our 2020 Routemap for Renewable Energy in Scotland published in 2011 set out the actions needed to achieve these targets. In October 2012 we published an update summarising the progress made over the past year, as well as considering what still needs to be done and the ways in which we are approaching these tasks.

Progress on our renewable electricity generation targets

We are on track to meet our renewable electricity targets. Electricity generation from renewables was at a record high in 2011, and figures published in December 2012 confirmed that we exceeded our interim target for the equivalent of 31% of electricity demand to be generated from renewables by the end of 2011.

4.6.2 With UK DECC statistics showing Scotland met the equivalent of 36.3% of its electricity demand from renewables in 2011, the update sets a new and more ambitious target of the equivalent of 50% of Scotland’s electricity demand met from green power by 2015 - an achievable target based on the sector’s rapid progress. This target will keep Scotland on the delivery path to meet the equivalent of 100% of Scotland’s electricity demand from renewable sources by 2020.
Our finalised renewable electricity generation figure for Scotland during 2011 is 13,728 GWh – up 27.6% on 2009, the previous record year for renewables.

In 2011, the equivalent of 36.3% of Scotland’s electricity needs were met by renewable sources.

The Scottish Government’s support for renewable electricity is delivering huge savings in greenhouse gas emissions. The UK Department of Energy and Climate Change estimated that Scottish renewable generation displaced 8.3 MtCO2e across the UK electricity grid in 2011. These savings will increase further in line with our renewables deployment, highlighting the role that renewables can play in combating climate change.

Scotland’s seas will play a huge role in this expansion beyond 2020. We are already investigating, through the marine planning process, the potential for additional sites for offshore wind, wave and tidal energy. These could provide the capability to more than double capacity and production from these sources, with at least an extra 10GW of potential supply for domestic use or export.

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87 [www.publications.parliament.uk/pa/cm201213/cmhansrd/cm120910/text/120910w0003.htm#12091037001745](http://www.publications.parliament.uk/pa/cm201213/cmhansrd/cm120910/text/120910w0003.htm#12091037001745)
4.6.3 In terms of validation of this progress, the Scottish Government has welcomed the recent central finding by the Economy, Energy and Tourism Committee that our renewable energy target for electricity generation is achievable, subject to a number of issues being addressed.

4.6.4 Our **Renewables Obligation (Scotland)** is an obligation on electricity suppliers to source an increasing proportion of electricity from renewable sources, which works alongside the other UK Renewables Obligations.

4.6.5 We have a range of funding programmes and initiatives such as the National Renewables Infrastructure Fund, our Community and Renewable Energy Scheme and funds for to support the development of offshore wind and the commercialisation of marine renewables. More details of these can be found in the Funding and Financing section earlier in the document.

### Sources of Electricity Generation in Scotland

#### Carbon capture and storage

Two CCS projects are putting Scotland at the front of CCS development and deployment: the CCGT station at Peterhead; and Summit Powers proposals for the Captain Clean Energy Project to be constructed in Grangemouth Port. Both have been shortlisted for the next stage of the UK Government CCS commercialisation competition which will involve intensive negotiations leading to decisions on which projects to support further through to the Front End Engineering Design (FEED) stage early in 2013.

**Peterhead**: a 340 MW Post-combustion capture retrofitted to part of an existing 1180 MW Combined Cycle Gas Turbine power station at Peterhead. Led by Shell and SSE.

**Grangemouth-Captain Clean Energy Project**: a proposal for a new 570MW, fully abated coal Integrated Gasification Combined Cycle (pre-combustion) project in Grangemouth, with storage in offshore depleted gas fields. This project is led by Summit Power, involving Petrofac (CO₂ Deepstore) National Grid and Siemens.

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4.7 The role of Carbon Capture and Storage

4.7.1 Our CCS Roadmap, published in 2010, highlights that Scotland has considerable advantages in CO₂ storage. Our ambition is for Scotland to lead the UK and EU in the development of CCS, and to maximise our comparative economic advantage through demonstrating this technology. CCS should be economically and technically proven by 2020 and progressively fitted to all coal and gas thermal plants in Scotland by 2030 to ensure full decarbonisation of the electricity supply.

4.7.2 Scotland is well-placed to take a lead on CCS and to capitalise on its position as the EU's largest potential offshore CO₂ store. We have knowledge and expertise in our universities and industry, the infrastructure in the North Sea, and the strong leadership in government necessary to make this happen and achieve our ambition of a low carbon energy economy.

4.8 Oil and gas

4.8.1 The oil and gas industry will play an essential role in the development of a low carbon economy in Scotland. At present, direct emissions from the sector do not form part of Scotland's emissions inventory, but the Scottish Government is committed to continued membership of the EU Emissions Trading Scheme (EU ETS) as the best way to ensure the industry recognises and manages the wider carbon costs of their activity.

4.8.2 The oil and gas sector is Scotland's largest by value. Gross Value Added for the Extraction of Oil and Gas in Scotland was around £27.3 billion in 2011. The skills, infrastructure and resources of the sector must therefore become the basis of a successful transition to a low carbon economy. The central long-term task is the cross-sector transfer of skills and infrastructure. Scotland's unparalleled knowledge of deep water engineering, for example, will support the nascent offshore wind and marine renewable energy industry. Analysis by Scottish Enterprise has shown that the use of the oil and gas supply chain has the potential to bring substantial cost efficiencies, reducing the cost of offshore wind installation and operation by 20%. Carbon Capture and Storage technology also rests on the maintenance of key infrastructure in the North Sea, bringing the potential to store immense volumes of carbon undersea.
4.8.3 More widely, the value chain that supports offshore extraction is the same valuable, interlinked set of industries that will ultimately support the commercial exploitation of low carbon goods, products and services. The Scottish Government has implemented a range of measures – most notably, the recent Renewable Energy Investment Fund – to encourage investment in this cross-sectoral transition.

4.9 Grid infrastructure and consents for renewable generation

4.9.1 We are driving forward initiatives to enhance grid interconnections between Scotland and the EU: the Scottish Government is working as part of the North Seas Countries Offshore Grid Initiative, which is focusing on the European priority of developing the Northern Seas Grid Infrastructure; and working with the Irish and Northern Irish Governments to promote grid interconnections for renewable energy in the Irish Sea and Atlantic.

4.9.2 The Scottish Government is committed to innovation and research, aimed at driving the development and deployment of renewable generation, including the Saltire Prize, the Scottish European Green Energy Centre (SEGEC), the European Marine Energy Centre (EMEC); and the revised approach to low carbon innovation set out in the Scottish Government's Low Carbon Economic Strategy.

4.9.3 Our section 36 guidance sets out policy and process for the application to Scottish Ministers for consent of renewable generation, as well as the Scottish Government's role and responsibility for determining applications for improvements to the electricity grid. Individual planning authorities can influence the development of renewables through their responses to Ministers' consultation, and through their own role in development planning and determining development proposals.

4.9.4 In the case of onshore wind, spatial frameworks prepared by planning authorities help to steer wind farms over 20MW (and under if considered appropriate) to the best locations and policy criteria set out in the development plan for deciding applications provides a clear indication of the potential for wind farms of all scales. The Scottish Government has developed on-line renewables planning advice to support planning authorities in preparing spatial frameworks and for considering the development of wind energy in their areas.
4.10 Energy market – powers and regulation

4.10.1 The way in which energy markets and energy generation, transmission and supply are regulated is vital to our decarbonisation plans. This applies to the market incentives for different kinds of renewable energy production, as well as for developing connections to the UK and Europe for the export of energy and ensuring security of Scotland's future energy supply.

4.10.2 Scotland’s renewables targets, and their reliance on being able to support, develop and export (across the UK and Europe) energy from a wide range of technologies, require a framework which is stable, and which supports the production of renewable energy in a sensible and sustainable way.

4.10.3 This is why we retain a profound interest in the progress of the UK’s Electricity Market Reform (EMR) proposals, and in changes to the relationship between governments and the UK energy regulator Ofgem contained in the UK Energy Bill.

4.10.4 The Energy Bill was introduced to the UK Parliament in November 2012. It contains proposals for fundamental reform of the electricity market, built around four mechanisms:

- a **Carbon Price Floor**, which will tax fossil fuel electricity generation in relation to the amount of CO₂ emitted, thereby improving the relative economics of low carbon generation;

- a system of long-term contracts, known as a ‘**Feed-in-Tariff with Contract-for-Difference**’ (FiT CfD), designed to provide a high level of certainty on revenue streams for low-carbon generators, thereby encouraging investment in such generation. This would replace the current Renewables Obligation (RO);

- a **Capacity Mechanism** which will help ensure security of supply by providing payments to ensure availability of sufficient generation capacity; and

- an **Emissions Performance Standard**, which will limit the permitted CO₂ emissions from coal power stations.

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90 [www.decc.gov.uk/en/content/cms/meeting_energy/markets/electricity/electricity.aspx](http://www.decc.gov.uk/en/content/cms/meeting_energy/markets/electricity/electricity.aspx)
4.10.5 We welcome the Electricity Market Reforms and UK Energy Bill and intend to work with the grain of the GB energy market now and into the future. But we are clear that the EMR must build on Scotland’s strengths and successes and not undermine them in any way. It is in the interests of both Scotland and the UK to protect the strong industry and investor confidence and growth we are delivering across the Scottish Energy Sector, renewables in particular, and in thermal generation and carbon capture and storage technologies⁹¹.

4.10.6 We remain committed to this work and to working with our UK counterparts. Our commitment echoes the wishes of the Scottish Parliament who, on the 13th September 2012, unanimously voted in favour of a motion which including the commitment “that the UK and Scottish Government should work constructively to deliver a strong, thriving, competitive and integrated electricity market”.

4.11 Costs and benefits of a low carbon energy mix

4.11.1 A continuing supply of electricity is essential for our economy and society. It will however require significant investment. As electricity generating assets reach the end of their operational life, they will need to be replaced with a diverse mix of generating technologies. Alternative and innovative methods of generation will replace traditional technologies reliant on carbon intensive fossil fuels. Our aim is to ensure that these costs are as low as possible, and affordable to consumers.

4.11.2 Energy price rises experienced in the previous decade have been largely driven by the rising international price for gas. Ofgem’s Project Discovery⁹² report points out that the next decade could be characterised by far greater price hikes and volatility if energy supplies are more reliant on fossil fuels than low carbon sources. Policies to decarbonise the electricity generation sector are key to breaking the link between electricity prices and uncertain fossil fuel prices.

4.11.3 Analysis by the independent Committee on Climate Change (CCC)⁹³ shows that energy bills have increased significantly in recent years, this is mainly due to increases in the international price of gas and investment in

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⁹¹ For more information on Scottish Government position on EMR, please see our website at http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Infrastructure/Grid-Connections/EMR-consultation-UK

⁹² http://www.ofgem.gov.uk/Markets/WhIMkts/monitoring-energy-security/Discovery/Pages/ProjectDiscovery.aspx

electricity/gas networks (contributing 62% and 16% respectively of the increase in household energy bills since 2004). The impacts are smaller for support for low-carbon technologies and support for energy efficiency improvement (less than 10% each of the increase in household bills since 2004).

4.11.4 By 2020, the CCC estimates that support for low carbon power generation will increase energy bills by around £100, while wholesale gas prices would add £130 under DECC’s central scenario. Additionally, increasing network costs will add £55, with smart meters and VAT adding around £5 and £20 respectively. This would £1,340 in 2020. However, energy efficiency policies and gas boiler replacement have the potential to reduce bills by £145; resulting in a total domestic energy bill of around £1,195.

4.11.5 DECC has also produced estimates of the impact of energy and climate change policies on average household energy bills in 202094. This analysis shows that by 2020 the average household’s energy bill would be 7% lower because of the net effect of the energy and climate change policies that have been established.

The value of investment in a low carbon electricity system

In the longer term, the Scottish Government is confident that investing now in a low carbon future is an economically viable and necessary thing to do. Beyond 2020, low carbon support mechanisms will continue to have a small impact on bills but this will offer greater certainty and reduce exposure to the risks of very high electricity prices under a system dominated by unabated gas generation. The CCC report highlights that if gas prices were to continue to rise, reliance on fossil fuels could mean that the average annual bill in a gas-based system could be as much as £600 higher in 2050 than in a low-carbon system.

4.11.6 Beyond electricity, the CCC’s advice on the UK Government’s Carbon Budget also highlights the importance of a decarbonised electricity supply in order to deliver challenges in heat and transport to meet our ambitious 2050 climate change targets.

94 http://www.decc.gov.uk/en/content/cms/meeting_energy/aes/impacts/impacts.aspx
Highlights of progress to date

- In 2010, final energy consumption was 6.2% lower than the 2005-2007 baseline adopted for the Scottish Government’s 12% energy efficiency reduction target, however it increased by 1.2% compared with 2009.

- Electricity generation from renewables was at a record high of 36.3% in 2011, exceeding the interim target for the equivalent of 31% of electricity demand to be generated from renewables by the end of 2011.

- Figures published in December 2012 show that output in the first 9 months of the year has already surpassed 2010’s annual output and is 15% higher than the same three quarters of 2011’s record year.

- Scottish ministers have consented 54 renewable projects since May 2007 - more than double the number for the previous four years.

- The £103 million Renewable Energy Investment Fund was opened for business in October 2012 and will leverage further private finance into green energy projects.

- The £35 million Prototyping for Offshore Wind Energy Renewables Scotland (POWERS) fund will support production of full-scale prototypes of next generation offshore wind turbines.

- The £18 million Marine Renewables Commercialisation Fund will accelerate the deployment of wave and tidal stream arrays in Scottish waters.

- Since May 2007, over 800 grants for community renewables, worth over £16 million were allocated under Community and Renewable Energy Scheme (CARES).

- The CARES Loan Scheme worth £7.75 million has supported 42 community-based energy generation projects since 2011. The recently relaunched scheme will make a further £23.5 million available to communities and rural businesses over the next three years.
5. **Homes and Communities**

5.1.1 Our homes are where we spend much of our lives and choose to relax with our families and friends. Naturally, we want to make them comfortable, warm and welcoming but, in a time of volatile utility costs, this can be expensive. And the way we use energy in our homes and appliances also results in significant greenhouse gas emissions.

5.2 **Our ambition for homes and communities**

5.2.1 Our **Sustainable Housing Strategy** (SHS) sets out our vision for warm, high quality, low carbon homes and a housing sector that helps to establish a low-carbon economy across Scotland. Following consultation, the SHS will be published during the first half of 2013 and will include a route map to 2030. The strategy’s aims are to:

- Make sure no-one in Scotland has to live in fuel poverty, as far as practicable, by 2016;
- Deliver a step change in provision of energy efficient homes to 2030 through retrofit of existing housing and improved building regulations for new build homes;
- Make a full contribution to the Climate Change (Scotland) Act targets; and
- Enable the refurbishment and house building sectors to contribute to and benefit from Scotland’s low carbon economy and to drive Scotland’s future economic prosperity.

5.2.2 In addition to the SHS vision, we are aiming for a largely decarbonised heat sector by 2050 with significant progress by 2030 through a combination of reduced demand and energy efficiency, together with a massive increase in the use of renewable or low carbon heating. Further detail on how we intend to achieve this will be in our Heat Generation Policy Statement, due for publication later in 2013.

5.3 **Where we are now**

5.3.1 In mid-2011, there were around 2.37 million households in Scotland, occupying 85% of the housing stock we expect to be in place by 2050. Household projections suggest over half a million additional homes will be

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95 [http://www.scotland.gov.uk/Topics/Built-Environment/Housing/sustainable](http://www.scotland.gov.uk/Topics/Built-Environment/Housing/sustainable)
needed to meet expected demand to 2035.\textsuperscript{96} A fifth of our homes are now over 90 years old and a third more than 67 years old. Detached houses, with generally higher emissions than other domestic properties (tenements have the lowest) have dominated the new build market since the early 1980s.

5.3.2 Over three-quarters of the energy we use in our homes is from gas-fired boilers for space and hot water heating. For accounting purposes, emissions from domestic electricity use are part of the ‘traded sector’. Therefore, reported emissions from homes arise almost exclusively from our use of gas for heating and cooking. In 2010, the residential sector produced 8.4 MtCO\textsubscript{2}e of greenhouse gas emissions, which was 15\% of Scotland’s total that year\textsuperscript{97}.

5.3.3 Indeed, in 2010, direct (non-electricity) residential emissions were 15\% higher than in 2009, but only 2.3\% higher than in 1990 - even though the housing stock has increased by more than 371,000 homes since then.\textsuperscript{98} Emissions in this sector are volatile as they depend heavily on weather conditions. Although there has been a general downwards trend since 2000, 2010 was one of the coldest winters on record. Household energy costs rose by 76\% in real terms between 2000 and 2010 - and may be expected to rise further. Better demand management can bring down energy bills and save money.

5.4 Decarbonisation policies and proposals

5.4.1 This section outlines policies and proposals that are driving the decarbonisation of our homes. They include UK and Scottish measures that will increase energy efficiency, provide consumers with improved information on energy use, and facilitate the decarbonisation of heat. The Scottish proposals are being developed or are under consideration by Scottish Ministers

Fabric improvement and heating efficiency policies

5.4.2 Our \textbf{Energy Assistance Package}\textsuperscript{99} offers energy efficiency advice to anybody who calls the Home Energy Scotland Hotline or makes contact

\textsuperscript{96} General Register Office for Scotland (2012). Household Projections for Scotland 2010-based.

\textsuperscript{97} Scottish Greenhouse Gas Emissions 2010: \url{http://www.scotland.gov.uk/Publications/2012/07/9583}

\textsuperscript{98} There were 2,124,000 dwellings in December 1990 and 2,495,000 in March 2011, the latest figure available (source: Scottish Government, \url{Housing and Regeneration Statistics})

\textsuperscript{99}Energy Assistance Package Scheme:
through the Energy Saving Trust’s website, highlighting the most appropriate sources of assistance to the householder. It also provides tariff and benefits checking, and insulation and central heating measures (new systems or repairs) to those most at risk of fuel poverty. On our behalf, the Energy Saving Trust manages delivery of the package in partnership with a range of advice providers and energy companies.

5.4.3 The Universal Home Insulation Scheme (UHIS)\(^{100}\) has provided free energy efficiency measures, including loft and cavity wall insulation, to Scottish households while delivering emission savings and helping to reduce fuel poverty. The scheme is delivered by local authorities in conjunction with local delivery partners. In 2012-13 all 32 local authorities were offered their share of a total investment of over £22 million.

5.4.4 And, under the Boiler Scrappage Scheme\(^ {101}\) we launched in 2010, householders - on a first-come, first-served basis - can receive a £400 voucher towards the replacement of certain inefficient boilers. The Scottish Government has a manifesto commitment to provide support for 30,000 boilers to be replaced during the course of this Parliament. The scheme is managed on our behalf by the Energy Saving Trust.

5.4.5 From April 2013, UHIS, the EAP and the Boiler Scrappage Scheme will be replaced by our new National Retrofit Programme (NRP) and the Warm Homes Fund\(^ {102}\). The NRP will refurbish or refit Scotland’s older homes to make them more energy efficient. This will save people money on their fuel bills and reduce emissions while providing opportunities for businesses as we develop our low carbon economy. Building on the success of previous schemes, the core of the programme will be area-based strategies, aimed initially at fuel poor areas.

5.4.6 Local authorities will play a key strategic role in identifying fuel poor areas and stock that requires upgrading and developing projects to tackle this. Scottish Government funding of £65 million per annum will be used to bring together a range of funding streams and lever maximum investment by the energy companies into Scotland. Initial pilot schemes supported by £3 million of Scottish Government funding are demonstrating the potential of this approach to leverage investment.

\(^{100}\) Universal Home Insulation Scheme: www.scotland.gov.uk/Topics/Built-Environment/Housing/warmhomes/uhis

\(^{101}\) Boiler Scrappage Scheme: www.scotland.gov.uk/Topics/Built-Environment/Housing/warmhomes/boilerscrappage

\(^{102}\) National Retrofit Programme: www.scotland.gov.uk/Publications/2012/06/8390/4
5.4.7 We launched our **Warm Homes Fund**\(^{103}\) in late 2012, to invest £50 million in green energy projects to further help heat homes across the country. The Fund provides grants and loans to install renewable energy measures such as biomass, hydro schemes, wind turbines and solar water heating. Councils and housing associations applying to the fund will be expected to use any income generated from their schemes to improve the energy efficiency of their existing housing. The fund will attract further finance from public and private sources.

**Warm Homes Fund**

Pilot schemes in Glasgow and the West Highlands will be the first to be benefit from the Warm Homes Fund. West Whitlawburn Housing Cooperative in Glasgow and West Highland Housing Association in Oban will both receive assistance for **biomass** heating schemes, helping more than 550 households to heat their homes more cost effectively.

5.4.8 Installing energy efficiency measures has traditionally required up-front payment – with the costs being recovered over time. We need to ensure that householders have access to finance for energy efficiency measures. The **Green Deal**\(^{104}\) is a GB wide policy that enables householders and other occupants of buildings to install energy efficiency improvements without up-front capital costs. Instead, they will pay for them over a period of years through a charge on their electricity bills. At the heart of the Green Deal financial mechanism is the ‘Golden Rule’ that estimated savings on bills should always equal, or exceed, the cost of the improvements undertaken.

5.4.9 While householders will have access to finance, energy companies also have obligations. **The Energy Company Obligation (ECO)**\(^{105}\) is a UK Government policy designed to replace both the Carbon Emission Reduction Target (CERT)\(^{106}\) and the Community Energy Saving Programme (CESP).\(^{107}\) The ECO requires energy supply companies to deliver energy efficiency measures to homes, with a twin focus on reducing heating costs for vulnerable consumer groups and saving carbon in hard to treat homes.

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\(^{103}\) Warm Homes Fund: [www.energysavingtrust.org.uk/scotland/Take-action/Get-business-funding/Warm-Homes-Fund](www.energysavingtrust.org.uk/scotland/Take-action/Get-business-funding/Warm-Homes-Fund)

\(^{104}\) DECC. Green Deal: [www.decc.gov.uk/en/content/cms/tackling/green_deal/green_deal.aspx](www.decc.gov.uk/en/content/cms/tackling/green_deal/green_deal.aspx)


\(^{106}\) DECC. Carbon Efficiency Reduction Target: [www.decc.gov.uk/en/content/cms/funding/funding_ops/cert/cert.aspx](www.decc.gov.uk/en/content/cms/funding/funding_ops/cert/cert.aspx)

\(^{107}\) DECC. Community Energy saving Programme: [www.decc.gov.uk/en/content/cms/funding/funding_ops/cesp/cesp.aspx](www.decc.gov.uk/en/content/cms/funding/funding_ops/cesp/cesp.aspx)
5.4.10 The carbon savings obligations are designed to ensure that support is available for measures such as solid wall insulation and hard to treat cavities, as well as providing targeted support for people in low income and rural areas. The home heating cost reduction obligation will support vulnerable, low-income households who live in the private sector and are entitled to defined benefits.

5.4.11 In Scotland, we will work to ensure that Green Deal finance providers are able to support households across Scotland. We will also work with the UK Government to ensure that Scotland-specific issues are fully recognised in the delivery of both schemes. Working through the Sector Skills Councils, the Scottish Qualifications Authority and Certification bodies we will ensure that there are sufficient qualified assessors and certified installers available to install the energy efficiency improvements in our homes. We are also developing an electronic register of buildings to support the delivery of the Green Deal and ECO.

5.4.12 Our Green Homes Cashback\textsuperscript{108} scheme is aimed at increasing the activity around installations of energy efficiency measures and also creating confidence in the Green Deal Assessor market by paying for the consumer's assessment. This is a £20 million programme which will be delivered during 2012-13 and 2013-14 and will provide up to £500 per cashback per household. Our Private Sector landlord cashback\textsuperscript{109} will also contribute to the replacement of inefficient appliances and boilers. These schemes are run on our behalf by the Energy Saving Trust.

5.4.13 In addition to improving the fabric of our existing housing stock, new homes need to be built to very low carbon standards. Housing built to 2010 standards emits 70% less carbon dioxide than housing built to the standards that existed in 1990. A review of Scottish domestic energy standards is currently underway and further review is planned for the future.

### Promoting innovation in new-build homes

We launched our new £10 million Greener Homes Innovation Scheme in September 2012 to provide incentives for developers to build greener homes that go beyond the current minimum building standards requirements for energy efficiency.

\textsuperscript{108} http://www.energysavingtrust.org.uk/scotland/Take-action/Find-a-grant/Green-Homes-Cashback-Scheme
\textsuperscript{109} http://www.energysavingtrust.org.uk/scotland/Organisations/Innovation/Free-resources-for-housing-professionals/Private-Sector-Landlords
Smart meters

5.4.14 Whilst much can be achieved through funding incentives, support and regulation, good information is also a critical factor in driving down energy use. We support the UK Government’s plan to install smart meters for gas and electricity in every home by 2020. A smart meter, together with an individual display unit (IDU) provides real-time information about energy use and costs, encouraging better household energy management. The roll-out across the UK, by energy suppliers, will take place between 2014 and 2019, although suppliers estimate that five million meters will have been installed prior to the official go-live date.

Fabric improvement and heating efficiency proposals

5.4.15 Ambitious work is already underway through the policies and programmes described above. However, we recognise more will need to be done and the following proposals are currently under consideration or in development.

5.4.16 We aim to continue our National Retrofit Programme to cover the whole of Scotland. This could involve a continuation of effort on hard to treat properties such as tenements, combining energy efficiency measures with tackling disrepair.

5.4.17 Regulation may need to play a part in improving energy efficiency. In the SHS consultation, we sought views on if, how and when to set minimum standards of energy efficiency for private sector housing. Feedback from the consultation will inform a stakeholder working group that will consider the issues and develop draft regulations for consultation.

5.4.18 Responses to the draft Sustainable Housing Strategy supported a lead in time between consulting on draft regulations and the application of any standards to allow time for householders and landlords to prepare for the changes. Scottish Ministers have previously stated that we would not look to set minimum standards before 2015 and our proposal at this stage assumes a minimum standard for all private sector housing to be introduced in 2018 (the same timescale being considered for the private rented sector in England and Wales).

5.4.19 We also need to consider social housing standards. Social landlords are already required to meet the Scottish Housing Quality Standard by 2015, and this includes an energy efficiency element. We propose to introduce a new energy efficiency standard for social housing in 2013.
setting initial targets to be met by 2020. This will further improve the energy efficiency of social housing, reducing energy consumption and fuel poverty and driving down emissions.\textsuperscript{110}

5.4.20 \textbf{New build domestic energy standards 2014.} As part of the review of building regulation energy standards in response to the recommendations of the Sullivan Report,\textsuperscript{111} we are consulting on the potential to cut new-build emissions by around 45\% compared to 2007 standards. In practice this will mean there will generally be less air-infiltration, improved fabric insulation, better heating controls, heating systems of greater efficiency and, for some building types, greater use of low carbon technologies - such as micro-generation - and innovative measures - such as wastewater heat recovery - to reach the emissions reduction standard.

\begin{boxedtext}
\textbf{New techniques and technologies}

Scotland’s Housing Expo held in Inverness in 2010 showcased master planning, passive energy techniques and new building technology in low carbon building design. The homes were designed to tight cost limits, some with predicted annual heating costs of less than £100.
\end{boxedtext}

5.4.21 Our modelling suggests that there is an \textbf{additional technical} abatement potential of approximately 0.65 MtCO\textsubscript{2}e by 2027 through improvements to the carbon efficiency of the housing stock. We intend to produce a detailed proposal in RPP3 on how we may realise this potential.

\textbf{Decarbonising heat policies}

5.4.22 The Scottish Government’s current policies and action on low carbon and renewable heat are set out in our Renewable Heat Action Plan,\textsuperscript{112} in the 2020 Routemap for Renewable Energy in Scotland\textsuperscript{113} and the Scottish Government’s outline of a draft Heat vision which was published in January 2013 alongside the draft RPP2.

\footnotesize\textsuperscript{110} Energy Efficiency Standard for Social Housing: \url{www.scotland.gov.uk/Topics/Built-Environment/Housing/sustainable/standard}

\footnotesize\textsuperscript{111} A Low Carbon Building Standards Strategy for Scotland: \url{www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/publications/sullivan}

\footnotesize\textsuperscript{112} Renewable Heat Action Plan: \url{www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-sources/19185/Heat/RHUpdate11}

\footnotesize\textsuperscript{113} Update to 2020 Routemap for Renewable Energy: \url{www.scotland.gov.uk/Topics/Business-Industry/Energy/UpdateRenewableRoutemap}
5.4.23 The Renewable Heat Incentive (RHI), a UK policy, was introduced in 2011 to incentivise the use of heat produced from renewable non-fossil fuel sources, such as wood fuel or heat pumps. It is key to us meeting our Scottish target of **11% of heat demand from renewables by 2020** and will play a significant role in decarbonising the heat sector by 2030. We have developed a range of supporting actions to increase deployment of renewable heat technologies in Scotland.

5.4.24 The RHI is being implemented in phases. Phase one focuses on the industrial and commercial sectors. The UK Government has also provided further short term support for installations of renewable heat technologies in the household sector through the **Renewable Heat Premium Payment scheme**\(^{114}\). Under the scheme, up-front costs for the installation of renewable heat generation will be met by installation owners, with the incentive guaranteeing them a reasonable return on investment.

5.4.25 The UK Government has recently consulted on proposals for a Renewable Heat Incentive for the domestic sector. The scheme is expected to be in place in summer 2013. The RHI is worth about **£90 million** to Scotland over four years, including the grant scheme for domestic users, with the sector expected to create up to 1,350 new jobs in this timescale.

5.4.26 The **District Heating Loan Fund**\(^{115}\) offers loans to support both low carbon and renewable technology solutions to a range of infrastructural issues and the costs of developing district heating networks. We have allocated at least £5 million to the scheme over this spending review period. It is open to local authorities, registered social landlords, SMEs and energy services companies in Scotland.

5.4.27 In June 2012 we announced a £5 million boost to the budget for **Home Renewables Loans**\(^{116}\), and an increase in the amount available for renewable heat to £10,000. The loans are providing support to individual householders to install renewable technologies in their homes and are available until March 2013 through the Energy Saving Trust, who have seen a sharp rise in the levels of interest since the announcement.

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114 DECC. Renewable Heat Premium Payment scheme
www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/premium_pay/rhpp_voucher/rhpp_voucher.aspx

115 District Heating Loan Fund:
www.energysavingtrust.org.uk/scotland/Take-action/Get-business-funding/District-heating-loan-fund2

116 Home Renewables Loans:
www.energysavingtrust.org.uk/scotland/Take-action/Find-a-grant/Home-renewables-loan-scheme
**Use of biomass**

Scottish Government policy is to promote the use of biomass plants for heat or for combined heat and power, with new plants relatively small in scale. This is to optimise local supply, serve localised heat markets and maximise efficient use of a limited fuel source.

Wood fuel use for energy production has more than tripled in the last five years. We are currently reviewing the blend of support available for biomass to establish a more appropriate balance between the support available, policy priorities and competing needs for the resource.

5.4.28 Heat mapping is fundamental in the development of our ambitions to decarbonise heat. Heat maps help identify and define future renewable heat opportunities in an area, particularly heat networks. We have already funded heat mapping in Highland, Fife and Perth & Kinross and we are rolling out the heat mapping programme to all local authorities in Scotland with the aim of creating a pan-Scotland heat map.

5.4.29 Heat mapping will support delivery of Scottish Government programmes such as expenditure under the REIF, the Warm Homes Fund, the District Heating Loan Scheme and implementation of the recommendations of the Expert Commission on District Heating as well as ensuring increased uptake of the Renewable Heat Incentive in Scotland.

**Decarbonising heat proposal**

5.4.30 While we are taking forward significant activity on decarbonising heat in Scotland, we recognise the need for a more strategic approach for significant decarbonisation of heat by 2030. Our new ambitious proposal for decarbonising heat, expressed in a new vision, hierarchy and Heat Generation Policy Statement, will include both the domestic and non-domestic sectors. As the majority of the emissions abatement is likely to fall in the non-domestic sector, details are at paragraph 6.5.10 in the next chapter. Given the significant policy work still to do in this area, the final abatement split between the Homes and Communities sector and the Business, Industry and Public Sectors may change.

5.5 **Supporting and enabling measures**

5.5.1 Access to information is vital to help people make low carbon decisions from transport through to energy efficiency in the home. We
have invested in the network of **Energy Saving Scotland Advice Centres** (ESSacs)\(^\text{117}\) to provide free advice and support across a range of energy efficiency matters to householders, businesses, communities, and local authorities and housing associations. This service will also provide the impartial remote advice service for Green Deal.

5.5.2 Important information is also available to existing and prospective property owners through **Energy Performance Certificates** (EPCs).\(^\text{118}\) They are required on completion of construction and at the point of sale or rental and provide energy efficiency information, allow comparisons to be made. They are accompanied with advice on ways in which energy efficiency of the building concerned could be improved in a cost-effective manner.

5.5.3 Information and support is also vital for community action. Communities working together can often achieve more than households and individuals acting alone. Our **Climate Challenge Fund**\(^\text{119}\) supports local communities in developing their own solutions for reducing greenhouse gas emissions. Since 2008, nearly 400 communities have undertaken projects from energy efficiency and insulation projects to active travel and sustainable food production. The fund empowers communities to deliver projects that are relevant to them and which leave a positive and sustainable legacy for the future. The fund supports communities to generate an income from their low carbon activity, where this can be achieved within State Aid rules, and the income is reinvested in further project activity which is consistent with a low carbon future.

5.5.4 The **Junior Climate Challenge Fund** operates alongside the main fund and supports projects which are designed, developed and delivered by young people (under 18s) whose future actions are crucial to the delivery of our climate change targets. The young people are engaged throughout, with funding decisions made by a youth panel.

5.5.5 Many people in Scotland live in historic and traditionally built houses and tenements which can be difficult to treat. Not only is it challenging to make these buildings more energy efficient, but there are often constraints related to their listed status. **Historic Scotland** is

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\(^{117}\) Energy Saving Scotland Advice Centres: [www.changeworks.org.uk/householders/essacs-landing-page/408/#householder](http://www.changeworks.org.uk/householders/essacs-landing-page/408/#householder)


\(^{119}\) Climate Challenge Fund: [www.scotland.gov.uk/Topics/Environment/climatechange/howyoucanhelp/communities/ClimateChallengeFund](http://www.scotland.gov.uk/Topics/Environment/climatechange/howyoucanhelp/communities/ClimateChallengeFund)
developing technical guidance\textsuperscript{120} on how to improve these properties and a number have already been published.

**Traditional buildings**

Traditional buildings should not be seen as inevitably “hard to treat” buildings, although they may need a distinct approach to adaptation. Historic Scotland is carrying out a number of refurbishment pilots to test the effectiveness of different interventions in traditional buildings and to develop cost effective improvements in thermal performance that respect their fabric and the appearance. A variety of dwelling types have been chosen, including small detached rural properties, a village hall and 19\textsuperscript{th} and 20\textsuperscript{th} century tenements in Edinburgh and Glasgow. The buildings are currently being monitored.\textsuperscript{121}

5.6 Costs and benefits

5.6.1 Decarbonising our homes will bring a multitude of benefits to both households and businesses. This section summarises the costs as well as highlighting the main benefits.

5.6.2 The energy efficiency retrofitting of existing homes and driving up energy efficiency standards for new homes will reduce the amount of energy people have to use and result in financial benefits, reducing fuel poverty. In some cases improving energy efficiency and upgrading homes may prevent ill-health resulting from living in cold damp housing.

5.6.3 The proposals and policies described will require significant investment in housing from the Scottish Government, consumers, energy companies and other sources. Annex A and the technical annex published with this RPP2 provide further information about these costs.

5.6.4 We aim to make Scotland the most attractive place in Great Britain for energy companies to invest in energy efficiency. Decarbonising homes has the potential to create many jobs through, upgrading existing homes, installing domestic renewable technologies and developing export markets. This will require new skills, for example, in modern methods of construction, and multi-skilling to enable retro-fit. It will also require the retention of specialist traditional skills for older and historic buildings. We will only be

\textsuperscript{120} Historic Scotland: www.historic-scotland.gov.uk/technicalpapers

\textsuperscript{121} Historic Scotland. Conservation Research: www.historic-scotland.gov.uk/index/heritage/conservation/conservation-research.htm
able to take advantage of these economic opportunities with a skilled and adaptable workforce.

**Thermal renovation and job creation**

While it is not straightforward to quantify the benefits in terms of job creation, the French Ministry for Ecology, Energy, Sustainable Development and Spatial Planning has estimated that ‘for every €1 million of investment in property-related thermal renovation, 14.2 jobs are created or maintained in the field of energy performance-related work’\(^{122}\).

5.6.5 We will continue to encourage industry to recognise the important role of training in preparing for these growth opportunities. There may be a need for new recruits, including currently under-represented groups, and returners affected by the recent economic downturn. Our National Training Programmes have at least 500 places in energy and low carbon industries. The introduction of the Green Deal will also result in training requirements for Green Deal assessors and potentially an element of up-skilling for installers.

5.6.6 We aim to ensure continuity for installers, particularly in the insulation industry. There will be new employment opportunities for installers, particularly with solid wall/hard to treat wall insulation, an industry so far relatively undeveloped in Scotland. The Green Deal will provide opportunities for SMEs as well as large businesses.

5.6.7 Driving down costs of energy efficiency measures will be particularly important in encouraging uptake. Social landlords are well placed to act as pioneers because of their ability to plan and manage major improvement programmes and offer economies of scale. This may be important in driving down costs of more expensive types of wall insulation and developing new approaches that can then be applied in the complex owner-occupier market.

Highlights of Progress to Date

In 2011-12 around 12,000 householders benefitted from the Boiler Scrappage Scheme and £7.5 million has been allocated for 2012-2013 to allow a further 18,000 householders to benefit, with a view to realising the manifesto target of 30,000 boilers three years early. It will also help us to reach the milestone we set in RPP1 that every home with gas central heating should have a highly efficient boiler.

The Scottish House Condition Survey (SHCS) shows that, by 2011, 65% of dwellings had 'good' energy efficiency ratings compared to only 31% in 2002.

The SHCS also shows good progress against the milestones we set in the first RPP that every home in Scotland should have loft and cavity wall insulation by 2020, where this is possible and cost-effective. In 2011 only 2% of lofts had no loft insulation, while 86% had 100 mm or more; and two-thirds of homes with cavity walls had these insulated. More than 400,000 Scottish homes benefitted from cavity wall and loft insulation measures in the four years to the end of 2012.

Since 2007, we have provided nearly £13 million in grants and loans direct to householders to help install micro-generation and we continue to fund the Home Renewables Loan Scheme to help householders benefit from the UK Feed in Tariff and Renewable Heat Premium Payments.
### 5.7 Homes and Communities abatement summary

<table>
<thead>
<tr>
<th>Homes &amp; Communities</th>
<th>Earliest start date</th>
<th>Annual Abatement (KtCO(_2)e) 2020</th>
<th>Annual Abatement (KtCO(_2)e) 2027</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Policies</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smart Metering</td>
<td>2012</td>
<td>88</td>
<td>95</td>
</tr>
<tr>
<td>Renewable Heat Incentive (Domestic)</td>
<td>2011</td>
<td>78</td>
<td>80</td>
</tr>
<tr>
<td>Energy Company Obligation (ECO) and Green Deal (GD)</td>
<td>2013</td>
<td>104</td>
<td>132</td>
</tr>
<tr>
<td>National Retrofit Programme: Scottish Government Fuel Poverty and Energy Efficiency Programmes</td>
<td>2013</td>
<td>207</td>
<td>207</td>
</tr>
<tr>
<td>Warm Homes Fund</td>
<td>2013</td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td>District Heating Loan Fund</td>
<td>2011</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td><strong>Proposals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulation of Private and Social Housing</td>
<td>2014</td>
<td>63</td>
<td>152</td>
</tr>
<tr>
<td>National Retrofit Programme: Insulation and Heat Programme</td>
<td>2018</td>
<td>33</td>
<td>167</td>
</tr>
<tr>
<td>Low Carbon Heat (Domestic)</td>
<td>2013</td>
<td>99</td>
<td>609</td>
</tr>
<tr>
<td>Additional Technical Potential in Fabric and Energy Efficiency</td>
<td>2018</td>
<td>210</td>
<td>650</td>
</tr>
</tbody>
</table>
6. **Business, Industry and the Public Sector**

6.1.1 This chapter addresses emissions from business, industry and the public sector. This sector is sometimes referred to as the ‘non-domestic’ sector. It focuses on emissions from buildings and some industrial processes. Emissions from transport, waste, etc. are dealt with in other relevant chapters in this report.

6.2 **Our ambitions for business, industry and the public sector**

- Our Energy Efficiency Action Plan\(^{123}\) has a Scotland wide target to reduce energy consumption by at least 12% This establishes a minimum level of ambition for all sectors, including the public sector.

- By 2027, we will have witnessed a complete transformation in the way Scottish public bodies work and in how their estates are managed: achieved through implementing and going beyond existing carbon management plans, sustainable procurement processes and supporting governance arrangements.

- By 2027, we will have made significant progress in transforming energy use in industry and business - transforming the way energy and resources are used, through energy and resource efficiency measures and low carbon technologies such as CCS and fuel switching.

- By 2050, direct emissions from the sector will be almost zero through reducing the sector’s demand for energy, the use of low carbon electricity sources; and deploying low carbon sources of heating and cooling.

6.3 **Where we are now**

6.3.1 The ‘public sector’ includes the Scottish Government and its executive agencies (such as Transport Scotland and Scottish Enterprise), 32 local authorities, and bodies such as the National Health Service trusts. There is a list of bodies subject to the Public Bodies Duties\(^{124}\) in the Climate Change (Scotland) Act 2009.

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\(^{124}\) Guidance to support public bodies in exercising their duties under the Climate Change (Scotland) Act 2009: [www.scotland.gov.uk/Publications/2012/01/05153413/1](http://www.scotland.gov.uk/Publications/2012/01/05153413/1)
6.3.2 Scotland has nearly **310,000 private sector enterprises** extending from construction and manufacturing companies to service providers and retail organisations. 2,230 large enterprises account for two-thirds of turnover while SMEs account for 99.3% of enterprises and 53.6% of employment. Industry in Scotland is varied and complex, covering very different modes of production, material demands, ownership and end products.

6.3.3 In 2010, greenhouse gas emissions from business and industrial processes were 7.9 MtCO₂e, which was 14% of the Scottish total. This includes some emissions that are covered by the EU ETS. Emissions from the public sector were 0.9 MtCO₂e, equating to 2% of the total.

6.4 Decarbonisation policies

6.4.1 A number of policies are already contributing to the decarbonisation of this sector. Some stem from the EU, some are UK Government policies and others have been developed by the Scottish Government. Together, they incentivise energy efficiency through financing and or regulation, improve the quality of information to energy consumers, and support the decarbonisation of heat sources.

6.4.2 The EU Emissions Trading System (ETS) is implemented at the Member State level, using a cap and trade mechanism to put a price on carbon to promote reductions of greenhouse gas emissions in a cost effective or economically efficient manner. The scheme is focussed on large, energy intensive installations as well as European aviation operators from 1 January 2013. Industry participants include cement and glass manufacturing as well as some distilleries. Most operators receive a set number of free EU Allowances (EUA), with each EUA covering one tonne of CO₂, and must trade or buy at auction any additional EUAs they require. As there is a set number of total EUAs within the market the overall environmental targets are maintained. The allocation of free allowances will be phased-out over time and more auctioning is being introduced.

6.4.3 The current EUA price is lower than expected, due mostly to the recession, and this has resulted in a smaller incentive to reduce emissions. As mentioned elsewhere in this document, Scottish Government officials are

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working closely with the UK Government to engage with the European Commission on potential structural reforms that could create a more effective EUA price.

6.4.4 At this point in time it is unclear how the ETS will develop after the current phase III ends in 2020. For the purposes of this report we are therefore not applying emissions savings generated by the carbon price mechanism of the ETS beyond 2020 but only emission reductions from the complementary policies detailed in this section.

Energy Efficiency Policies

<table>
<thead>
<tr>
<th>EU Energy Efficiency Directive</th>
<th>128</th>
</tr>
</thead>
<tbody>
<tr>
<td>In 2012, the European Union passed a new Directive on Energy Efficiency on efficiency targets, efficiency in energy use (public bodies, obligation schemes, audits, billing), efficiency in energy supply (heating and cooling, transformation, transmission and distribution) and energy services. This Directive is due to be implemented by June 2014 and is expected to contribute approximately 17% to the energy efficiency target set for 2020 against a business as usual baseline.</td>
<td></td>
</tr>
<tr>
<td>A key article (Article 5) requires central government to renovate 3% of its own estate each year to lead by example and to encourage the rest of the public sector to do the same. The rate of building renovation needs to be increased as existing building stock represents the biggest potential sector for energy savings. Buildings are crucial to achieving energy efficiency and greenhouse gas emissions targets.</td>
<td></td>
</tr>
<tr>
<td>The Scottish Government aims to work closely with UK counterparts to ensure that the Directive is effectively implemented to the required timescales.</td>
<td></td>
</tr>
</tbody>
</table>

6.4.5 The Carbon Reduction Commitment (CRC) Energy Efficiency Scheme 129 is a UK wide policy designed to incentivise investment in energy efficiency. In Scotland, there are 133 full participants in the scheme, which together emitted around 4.5 MtCO₂e in 2010-11.

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6.4.6 The Scheme requires large non-energy intensive organisations to measure and report their carbon dioxide emissions and purchase allowances issued by the UK Administrator\(^\text{130}\) for each tonne of carbon dioxide they emit. The Scheme targets the emissions of large businesses and public sector bodies that are not covered by the EU Emissions Trading System or Climate Change Agreements. Following consultation during 2012 the Government published a number of simplifications to the scheme which will reduce the burden on participants. The scheme will be reviewed again by the UK and Scottish Governments in 2016.

The **Climate Change Levy**\(^\text{131}\) is a UK Government tax on the use of electricity, gas and solid fuels in the non-domestic sector. Revenue raised through the levy is recycled back to organisations through a reduction in employers’ national insurance contributions and support for energy efficiency and low carbon technologies. All non-domestic (public and private) organisations pay this in full unless they have entered into a Climate Change Agreement or have a renewable energy supply.

The voluntary **UK Climate Change Agreements**\(^\text{132}\) enable eligible energy intensive businesses to receive up to 65\% discounts (increasing to 90\% for electricity use from April 2013) from the Climate Change Levy in return for meeting energy efficiency or carbon saving targets. Around 450 facilities in Scotland have Climate Change Agreements.

6.4.7 Access to funding is a critical aspect of achieving energy efficiency. The **Non-Domestic Green Deal**\(^\text{133}\) is a GB wide policy. From early 2013 non-domestic property owners and occupiers will be able to apply for energy efficiency measures funded through private finance with costs recouped from charges on energy bills. The amount of finance will be based around a ‘golden rule’ whereby the repayments on the meter will be equal to or less than the savings identified during the assessment. On that basis, the total amount available will vary from building to building and measure to measure. When properties are bought and sold or rented, the charge for finance will be transferred to the new bill payer. Current estimates are that Green Deal investment could amount to £14 billion across UK over the next

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\(^{130}\) With the agreement of Scottish Ministers, the Environment Agency operates as UK Administrator for the purpose of allowance sales.

\(^{131}\) DECC. Climate Change Levy: [www.decc.gov.uk/en/content/cms/emissions/ccas/cc_levy/cc_levy.aspx](http://www.decc.gov.uk/en/content/cms/emissions/ccas/cc_levy/cc_levy.aspx)

\(^{132}\) DECC. Climate Change Agreements: [www.decc.gov.uk/en/content/cms/emissions/ccas/ccas.aspx](http://www.decc.gov.uk/en/content/cms/emissions/ccas/ccas.aspx)

\(^{133}\) DECC. Non-Domestic Green Deal: [www.decc.gov.uk/en/content/cms/tackling/green_deal/gd_customer/gd_nondomcust/gd_nondomcust.aspx](http://www.decc.gov.uk/en/content/cms/tackling/green_deal/gd_customer/gd_nondomcust/gd_nondomcust.aspx)
decade, and Scotland is well placed to secure a proportionate share of this investment.

6.4.8 To support Green Deal implementation, we have developed a Green Deal assessor qualification in Scotland in conjunction with Asset Skills Scotland - the employer-led skills body for facilities management, housing and property - and the Scottish Qualifications Authority (SQA), the national accreditation and awarding body. £1 million has been allocated by UK DECC for the training of up to 1,000 Green Deal Assessors. We are also working with Skills Development Scotland, the national skills body supporting the people and businesses of Scotland, to assess demand and determine what follow-up action we should take.

**Energy Efficiency Small Business Loans Scheme: Kinloch Anderson**

Kinloch Anderson, an Edinburgh highland kilt manufacturer, was referred to its local Energy Saving Scotland advice centre (ESSac) through the company’s business manager at Scottish Enterprise. An energy consultant visited the company’s premises to outline ways in which the firm could improve its energy efficiency and how a loan could assist.

Consequently, the company installed a new steam press and ironing system. The ironing press is in constant use. Kinloch Anderson’s Chief Executive, Nick Bannerman, said: “In terms of energy costs the move is saving us around £3,500 per annum. It has also increased our operating efficiency by allowing us to get more work done in a shorter space of time. The small business loans scheme has really been of great benefit to us.”

6.4.9 A £1.5 million training fund for installers across the UK who wish to operate under the Green Deal is also available and we are working with Construction Skills - the sector skills council for the construction industry - to ensure that Scottish installers are offered a share of this.
National Health Service Scotland CEEF Projects

NHS Greater Glasgow and Clyde is investing £200,000 to replace an inefficient refrigeration plant at Glasgow Royal Infirmary with the latest high efficiency plant. This resulted in a payback period of three years and an annual saving of £72,000 and 0.39 ktCO₂e.

NHS Fife spent £11,000 to improve the management of its heating and air conditioning plant at the Queen Margaret Hospital. This resulted in annual savings of £23,000, a payback period of 6 months and a reduction of 0.177 ktCO₂e per year.

6.4.10 The UK has set up the world’s first investment bank solely dedicated to greening the economy, the Green Investment Bank (GIB).\(^{134}\) Large scale non domestic energy efficiency projects will form one of the three initial priorities for the bank. Further information on the GIB can be found in the funding and financing section.

6.4.11 Other sources of finance include the Central Energy Efficiency Fund and the Energy Saving Small Business Loan Scheme detailed in the funding and financing section earlier in this document.

6.4.12 The policies above largely relate to the use of existing buildings. However, we also need to take action with new buildings. Most recently, new-build energy standards for non-domestic buildings were applied in 2010 as a Scottish policy. Non-domestic buildings built to these standards have emissions 30% lower than those built to 2007 standards. In practice this means that there is; less air-infiltration, improved fabric insulation (with less thermal-bridging), better heating and lighting controls, heating and cooling systems of greater efficiency and for some buildings, limited use of low carbon technologies (such as micro-generation) to reach the emissions reduction standard.

Decarbonising heat policies

6.4.13 The Renewable Heat Incentive (RHI), introduced in 2011, is a UK policy to encourage public sector bodies, businesses and communities to reduce emissions by using heat from renewable sources such as wood fuel or heat pumps. Under RHI, up-front costs for the installation of renewable heat generation are met by installation owners with the incentive scheme

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\(^{134}\) BIS. Green Investment Bank: [www.bis.gov.uk/greeninvestmentbank](http://www.bis.gov.uk/greeninvestmentbank)
guaranteeing them a reasonable return on investment. Phase 1 focuses on the industrial and commercial sectors.

6.4.14 We recognise that Government has a role in supporting the construction of combined heat and power plants (CHP) and heat networks. We have made a number of clear policy statements including through our 2020 Routemap for Renewable Energy in Scotland. We have introduced a range of funding support for heat networks, including the district heating loan scheme (see below) and the Renewable Energy Investment Fund and we also continue to make the case to the UK Government that the RHI should include an uplift for district heating.

6.4.15 We are working with our Expert Commission on District Heating and providing support through the district heating loan scheme to overcome the barriers and challenges facing developers. The scheme is open to local authorities, registered social landlords, SMEs and energy service companies. We have allocated £5 million over the current spending review period.

6.4.16 As noted in the previous Homes and Communities chapter, heat mapping is critical to heat decarbonisation in this sector too, and we are rolling it out to all local authorities in Scotland.

6.4.17 As the majority of industrial emissions arise from generating heat from fossil fuels for manufacturing processes, changing to lower carbon fuels such as sustainable biomass and biogas represent one of the most important means for transformation.

6.4.18 The type of fuel switching will differ between sectors. For lower temperature processes, for example those involved in the food and drink industry, a range of options may be available. These include using biomass boilers to generate steam or ‘process integration’ for exploiting heat already used in higher temperature processes. Higher temperature processes often

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136 District Heating loan scheme: www.scotland.gov.uk/News/Releases/2012/10/districtheating1102012
137 Heat Mapping in Highland Region: www.highland.gov.uk/yourenvironment/planning/energyplanning/renewbleenergy/HighlandHeatMappingProject
present a greater challenge and may need innovative solutions such as sustainable biomass to replace coke, or a shift towards the electrification of processes. Fuel switching will develop gradually, depending on the needs of each sub sector of industry in Scotland, and in particular, the temperature of the heat required.

6.4.19 For some industrial processes, greenhouse gas emissions are an intrinsic part of the chemistry and can only be mitigated through innovative options such as carbon capture and storage. In the longer term, the deployment of sustainable biomass and further carbon, capture and storage should be able to address remaining combustion and the carbon dioxide component of process emissions.

6.4.20 Process emissions will also need to be tackled. **Fluorinated gases** (F-gases) are part of Scottish Government Climate Change Targets. In 2010, the latest year for which Scottish figures are available, F-gases made up 2.3% (c1.3 MtCO₂e) of total Scottish greenhouse gas emissions. This has increased from 0.33% in the 1995 base year, primarily due to the take up of Hydrofluorocarbons to replace phased-out Ozone-Depleting Substances. F-gases also make up 2.4% of UK greenhouse gas emissions (including international aviation and shipping).

6.4.21 EU Regulations put in place offences and penalties covering infringements in relation to leakages; leakage checking/leak detection systems; placing on the market prohibitions; and qualifications for personnel working on equipment. Sectors affected by these regulations are stationary refrigeration, air-conditioning and heat pumps; stationary fire protection; and high voltage switchgear in electrical transmission networks. The Regulations also provided enforcement powers for the Scottish Environment Protection Agency (SEPA). The EU Regulations were implemented in the UK by the Fluorinated Greenhouse Gases Regulations 2009.

6.4.22 We have been working with SEPA and the UK Government to develop a regulatory framework for F-Gases in Scotland and have recently finished a comprehensive review of industry to provide a framework for this regulation. There is now a legislative proposal from the Commission for a revised F-gas Regulation and the Scottish Government has worked with the UK Government to offer comments on the way forward. The UK Government plans to hold a stakeholder meeting in early 2013 and the Scottish Government will attend in support.
Smart Meters and products policies

6.4.23 Understanding an organisation’s energy use is critical to reducing it. The UK policy of introducing smart electricity and gas meters will provide organisations with more accurate information supporting efficient use of energy, and cost savings. Smart meters will be rolled out to potentially, over 200,000 non-domestic small users in Scotland by 2019.

6.4.24 An important way of reducing the energy we use is through the design of more energy efficient products. EU Products policy is addressed through the Eco-design Framework Directive which allows minimum environmental performance standards for products to be set across the EU. The standards are set through regulation or voluntary agreements. The regulations aim to improve the environmental performance of products by reducing the impact of a product’s life-cycle on the environment.

6.4.25 One of the effects of this kind of regulation is to reduce the electricity consumption of many products. This also tends to reduce the amount of heat emitted from these products because much of the electricity that inefficient products consume is wasted through heat production. As lighting and appliances become more energy efficient, heating and cooling systems compensate for this reduction in heat. The effect in terms of emissions accounting is to very slightly increase emissions from heat but to reduce emissions from electricity generation by a greater amount. The heat element of these emissions is shown directly in the breakdown of emissions abatement provided in this report; the savings from reduced electricity consumption are incorporated into the modelling used to estimate emissions from the traded sector.

6.4.26 Likewise, the Energy Labelling Framework Directive sets energy labelling requirements for products across the EU. It requires that a standard label showing energy efficiency, and other sustainability aspects, such as water consumption, is displayed on products where they are sold. The UK Government leads on compliance with both Directives.

139 ibid
BT’s Energy Saving Campaign

BT ran a staff engagement pilot in its London headquarters of c.3,000 employees to reduce energy use by 10% BT engaged staff by: recruiting energy champions from across all levels of the business to raise awareness of the campaign to reduce energy waste by reporting faults, conducting energy audits and encouraging networking to share ideas; and Identifying areas of the business where significant savings could be made. Importantly it engaged with staff members who had the influence to implement changes within these areas.

In the three months of the pilot, energy consumption was reduced by 17% equating to cost savings of around £200,000. BT has now rolled out the initiative to 25 of its other buildings, four of which are in Scotland. This has led to annual savings of over £800,000 for the company. As one manager put it:

“*It’s our corporate social responsibility; companies should be leading by example. People can be involved by just being energy efficient. In that sense, everyone can be an energy champion*.”

6.5 Decarbonisation proposals

The following Scottish proposals are being developed or are under consideration by Scottish Ministers.

6.5.1 Non-domestic buildings new-build energy standards 2014 – Scottish Proposal. Our review of standards in response to the Sullivan Report considered the potential to cut new-build non-domestic building emissions by up to 75% compared to 2007 standards. We have now reached the consultation stage. The supporting costing research (as recommended by Sullivan) indicates that costs of a 75% improvement will take a considerable period of time to payback through energy bills. We are consulting on a proposed 60% improvement that will often payback within the projected lifespan of the buildings.

6.5.2 The proposals for a 60% reduction in emissions involves moving to an aggregate emissions based approach. This means that whilst not all buildings will deliver the same level of reduction, the overall reduction in emissions will be 60%. In practice there will generally be; less air-infiltration, improved fabric insulation (unless this causes overheating
issues), better heating and lighting controls, heating and cooling systems of greater efficiency and for some building types, greater use of low carbon technologies (such as micro-generation) to reach the emissions reduction standard.

6.5.3 Non-domestic buildings: assessment of energy performance and emissions regulations. Buildings account for over 40% of greenhouse gas emissions in the UK. However, as less than 1% of the existing stock is replaced by new buildings each year, regulations are to be introduced under Section 63 of the Climate Change (Scotland) Act for the assessment of the energy performance and emissions of existing non-domestic buildings and for owners to improve the energy performance of their buildings and to reduce emissions.

6.5.4 We are currently developing these regulations and the owners (and occupiers) of large buildings will be given the option of either physically improving their buildings, or measuring and reporting the operational energy use on a year on year basis. The response to our 2011 consultation is available on our website.

6.5.5 Initially, the policy would be implemented broadly in line with the consultation, covering buildings over 1000 square metres. The policy would be reviewed within 10 years and the scope could be widened by possibly requiring the building improvements be carried out, without recourse to operational ratings. Alternatively, they could go further by including all buildings over 250 square metres and increasing the assessment frequency. However, no investigation into the practicalities of widening the scope of the policy has been developed at this stage.

6.5.6 We propose to ramp up emission reductions in the public sector. We know, through research undertaken on our behalf by the Carbon Trust, that public bodies in Scotland could do more to reduce emissions from their own estates. Initially this would involve accelerating implementation of actions identified in existing Carbon Management Plans, and later move to more ambitious activity.

6.5.7 The Carbon Trust research was designed to identify what additional abatement in the public sector might be feasibly delivered between now and 2027-30. The report shows that with an accelerated programme of implementation there is the potential to reduce emissions across the public

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140 Building Standards Consultation: www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/publications/pubconsult/S63SGR
141 Potential Carbon Abatement from the Scottish Public Sector: www.scotland.gov.uk/Publications/2012/12/3885
sector by 291 ktCO\textsubscript{2}e by 2020. The report identified that over 30% of this abatement would be delivered by measures already identified, and it is estimated that there is additional potential to reduce emissions by 285 ktCO\textsubscript{2}e by 2027.

6.5.8 These are non-traded building emissions and are significantly greater than current activity in public bodies' Carbon Management Plans (CMPs). Achieving the full abatement potential will require a significant uplift of activity in the existing carbon management plans across the entire public sector. Actions are likely to involve behavioural change at organisational and individual levels, making our estate more energy efficient and the use of renewable energy sources.

6.5.9 To develop this **proposal into a clear plan of action** we will consider, review and conclude the following by October 2013:

- Our governance and leadership arrangements;
- Whether to set a target or set of targets for Scottish public bodies linked to mandatory reporting of emissions in the context of the Public Bodies Duty set out in the Climate Change (Scotland) Act;
- What more might be done through our procurement activities;
- Funding and financing options, working with the Scottish Futures Trust; and
- The skills and expertise within our public bodies for both accelerating emission reductions and carbon accounting.

### The National Library of Scotland

The National Library of Scotland (NLS) has implemented a Carbon Management Plan which has reduced emissions and produced significant savings in running costs. The plan comprised 15 individual projects covering a range of actions from investment in building services equipment, to awareness raising and changes to operating procedures. Carbon management at the NLS has reduced carbon emissions by 0.62 KtCO\textsubscript{2}e and saved £75,000 on energy bills per year.

### Decarbonising heat proposal

6.5.10 While we are taking forward significant activity on decarbonising heat in Scotland, we recognise the need for a more strategic approach for
significant decarbonisation of heat by 2030. Our recent Renewables Routemap update signalled our intention to develop a comprehensive heat vision for Scotland, including a heat hierarchy of demand to encourage best practice in urban and rural areas, together with a Heat Generation Policy Statement to consider scenarios for supply.

The renewable heat target

Our 11% renewable heat target as it is currently defined requires approximately 6,400 GWh of energy to be sourced from renewables by 2020. Assuming conservatively that this could be achieved by displacing gas, the target could reduce emissions in Scotland by over 1 MtCO$_2$e in 2020.

6.5.11 Our ambition for heat is that by 2050, Scotland will have a largely decarbonised heat sector with significant progress by 2030. For 2027, this means total estimated abatement of 3 MtCO$_2$e from the domestic and non-domestic sectors. However, it is based on the fundamental first principles of:

- keeping demand to a minimum; and
- recovering as much waste heat as practically possible, at least cost to consumers.

6.5.12 Our heat vision outline$^{142}$ brings together policy and a renewed focus to heat, both low carbon and renewable, stretching across all sectors - domestic, non-domestic, industrial and commercial - to put us on course to fully realise the potential for decarbonising heat in Scotland. The heat vision looks at heat in the wider context of available energy resources, setting out our statutory and regulatory responsibilities; highlighting policy drivers; and providing clarity on our position of overarching principles for future heat deployment.

6.5.13 In considering the impacts on both supply and demand we have developed a draft heat hierarchy and deployment options matrix on which we will be seeking comments. The hierarchy considers heat in high and low building density contexts across domestic, industrial and the commercial/public sector. It includes reference to energy efficiency, district heating with different energy sources, electricity and individual solutions including micro-generation.

$^{142}$ The Heat Vision Outline will be published on the same day as this draft RPP2. A publication reference and web address will be included in the final version of RPP2.
6.5.14 We are taking a pragmatic approach to the development options matrix. For example, we expect that out to 2020 dense urban areas will be more suited to district heating, with the initial infrastructure likely to be non-renewable in areas on the gas grid. However, the ultimate aim is to encourage the most low carbon solution for all buildings in the area. In the long term, we would expect a shift to renewables and a significant reduction in heat demand in buildings through implementation of energy efficiency measures to achieve this. District heating will still be relevant for many rural areas, even those classed as 'very remote'.

6.5.15 The Heat Generation Policy Statement will look in more detail at possible generation scenarios, including their impact on the renewable heat target and associated greenhouse gas emissions. When published later in 2013, this document and our Electricity Generation Policy Statement, will provide a comprehensive energy policy view and, along with our developed Heat Vision, set out the framework for the transition to decarbonising heat in Scotland.

6.6 Supporting and enabling measures

6.6.1 Clear accessible information is critical for organisations wanting to improve their energy efficiency and reduce waste. We are integrating our non-domestic energy and material resource efficiency services and expect our new Resource Efficient Scotland advice and support programme to be operational from April 2013. It will provide valuable support to businesses, third sector and public sector organisations to reduce overheads through improved energy, material resource and water efficiency, and reducing waste.

6.6.2 The Resource Efficient Scotland programme will integrate current services delivered through the Carbon Trust, the Energy Saving Trust and Zero Waste Scotland into one simple service. The programme will help cut carbon across public and private sector organisations. This holistic approach to low carbon transition aims to help more organisations to reduce their emissions, save money and increase their competitiveness. The programme will have three components:

• A Scotland-wide Integrated Business and Public Sector Advice and Support core service. It will deliver technical advice and support to all business and public sector organisations on waste material resource use, energy and water efficiency. It will focus on the implementation of resource efficiency measures, including advice around finance;

• a suite of tailored sector-focused activities for business and the public sector. Effort in the first instance may include construction, food and drink, hospitality, public sector, textiles, chemicals and manufacturing. More sectors will be included as the programme evolves; and

• an Integrated Business and Public Sector Intelligence strand will support the whole programme through continual development and improvement processes.

6.6.3 As noted previously in (paragraph 5.5.2), Energy Performance Certificates (EPCs) are an important source of information. They provide existing and prospective building owners with energy efficiency information and allow comparisons to be made. They are also accompanied with advice on ways in which efficiency could be improved in a cost-effective manner.

6.7 Costs and benefits

6.7.1 While these policies, supporting measures, and proposals will drive emission reductions they will also bring a range of other benefits. A recent UK study estimated that around 2.3% of GDP could be saved from straightforward resource efficiency measures by using raw materials more efficiently and generating less waste. In 2010, that would have meant £2.9 billion savings to the Scottish economy - over half of the savings can be made within businesses (£1.5 billion) raising profitability directly.

6.7.2 Taking up remaining opportunities for energy, material and process efficiency will reduce manufacturing costs and boost the competitiveness of industry in Scotland. Low carbon manufacturing, using inputs such as sustainable biomass and future supplies of decarbonised electricity may increasingly be demanded by both UK and export markets.
6.7.3 Moving to low carbon technologies in other sectors of the economy will also create new markets for the goods, such as niche low carbon vehicles, produced in Scotland. We also depend on industry to manufacture some components in Scotland – products which need to become ever more energy efficient and low carbon over the coming decades.

6.7.4 The proposals and policies described will require investment from the public sector, business and other sources. Annex A and the technical annex published with this RPP2 provide further information about these costs.
## Highlights of progress to date

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
<th>Amount invested by SG (£m)</th>
<th>Estimated savings (lifetime)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Carbon Trust advice and support programme</strong></td>
<td>Between 2007-08 and 2011-12, The Carbon Trust has provided energy efficiency and low carbon advice and support to larger businesses and public sector.</td>
<td>23</td>
<td>920</td>
</tr>
<tr>
<td><strong>Central Energy Efficiency Fund</strong></td>
<td>Launched in 2004, the ring-fenced fund has supported over 95 projects in Scotland’s NHS with emissions reductions of around 167 KtCO₂e and revenue savings of over £5.3 million. Scottish Water reported lifetime savings of over 770 KtCO₂e and of over £90 million.</td>
<td>20*</td>
<td>95.3</td>
</tr>
<tr>
<td><strong>Salix Finance loans fund</strong></td>
<td>Salix manages a £5 million revolving loans fund to support low carbon investment projects in the further and higher education sectors and in the emergency services.</td>
<td>5</td>
<td>42</td>
</tr>
<tr>
<td><strong>Energy Saving Trust advice and support service</strong></td>
<td>On our behalf EST provides energy efficiency advice and support to SMEs.</td>
<td>3</td>
<td>29.5</td>
</tr>
<tr>
<td><strong>Green Investment Package</strong></td>
<td>We have committed £10.3 million between 2012-13 and 2013-14 to enhance public sector loans funds and energy efficiency projects.</td>
<td>10.3</td>
<td>-</td>
</tr>
<tr>
<td><strong>Small Business Loans Scheme</strong></td>
<td>Hosted by EST on our behalf, loans of £1,000 - £100,000 are available to SMEs to install renewable energy technologies or measures that reduce energy consumption.</td>
<td>11.1</td>
<td>16.2</td>
</tr>
<tr>
<td><strong>Scottish Government Estate - Energy Performance Improvement Projects</strong></td>
<td>Investment into energy efficiency and improvements across the Scottish Government Estate.</td>
<td>1</td>
<td>1.7</td>
</tr>
</tbody>
</table>

* Money invested prior to 2007/08
** Estimated cumulative annual savings over period 2012-2014
6.8 **Business, Industry and the Public Sector abatement summary**

<table>
<thead>
<tr>
<th>Business, Industry &amp; Public Sector</th>
<th>Earliest start date</th>
<th>Annual Abatement (KtCO$_2$e) 2020</th>
<th>Annual Abatement (KtCO$_2$e) 2027</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policies</td>
<td></td>
<td></td>
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<tr>
<td>Smart Metering</td>
<td>2013</td>
<td>53</td>
<td>46</td>
</tr>
<tr>
<td>CRC Energy Efficiency Scheme</td>
<td>2010</td>
<td>130</td>
<td>154</td>
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</table>
7. Transport

7.1.1 Transport emissions, including international aviation and shipping, make up just under a quarter of Scotland’s total emissions, and more than two thirds of these emissions come from road transport.

7.1.2 Over the past few decades, there has been a large rise in the distance we travel, mostly through car travel. Around 84% of the 2.7 million vehicles in Scotland in 2010 were cars, 9% were light goods vehicles, 2% were motorcycles, and heavy goods vehicles accounted for about 1% Active travel, walking and cycling, accounts for less than 3% of total mileage travelled each year.

7.2 Our ambitions for decarbonising transport

7.2.1 Our ambition is for almost the complete decarbonisation of road transport by 2050. In RPP1, we set milestones to 2020:

- A mature market for low carbon cars resulting in achievement of an average efficiency for new cars of less than 95 gCO₂e/km;
- an EV charging infrastructure in place in Scottish cities;
- Personalised travel planning advice provided to all households;
- Effective travel plans in workplaces with more than 30 employees; and
- At least 10% of all journeys made by bicycle.

7.2.2 We aim to see significant progress in the decarbonisation of road transport by 2030 through wholesale adoption of electric cars and vans, and conversion to hybrid or alternatively-fuelled HGVs and buses – as well as significant steps to decarbonise rail and maritime transport. We are also aiming for significant modal shift towards public transport and active travel.

7.2.3 Given sufficient progress to 2020, electric vehicle uptake could accelerate in the 2020s. Key drivers will be the continued installation of high powered charging facilities, increases in vehicle range and reductions in cost. By 2030, potentially 60% of new vehicles (over 30% of fleet) will be plug-in hybrid (PIH) or pure electric vehicle (EV).¹⁴⁴

¹⁴⁴ Based on the current fleet size (2.4 million) and new car sales of 168,000, these percentages equate to new sales of 100,000 cars and a low carbon car fleet of 720,000.
7.3 Where we are now

7.3.1 Transport emissions in 2010 amounted to 13.2 MtCO$_2$e or 24.1% of total Scottish emissions, and the majority (9.4 MtCO$_2$e) was from road transport.\(^{145,146}\)

7.3.2 Overall, transport emissions (including international aviation and shipping) have increased 1% from levels seen in 1990. In 2010, emissions from domestic transport were 2% higher than 1990, at 10.7 MtCO$_2$e, whilst emissions from international aviation and shipping in 2010 remained at the 1990 level of 2.5 MtCO$_2$e (aviation emissions went up significantly and shipping went down).

7.3.3 However, emissions in 2010 were slightly lower than in 2009 – giving three consecutive years of reductions. In 2010, road traffic fell 1.7% compared to 2009, attributable mainly to a fall in car traffic. The intermittent recovery from the economic recession clearly continues to play a significant part in the recent reduction in reported transport emissions. However, the current Business as Usual projection for transport emissions suggests that they will increase by 11% from 13.5 MtCO$_2$e to 14.8 MtCO$_2$e between 2013 and 2027.

7.3.4 Car emissions currently account for 5.3 MtCO$_2$e, or around 55% of surface transport emissions. Average vehicle emissions are falling steadily as a consequence of improved engine efficiencies and currently stand at 159 gCO$_2$e/km. However, these gains have been offset by increased car travel.\(^{147}\)

7.3.5 In 2011, the Society of Motor Manufacturers and Traders calculated that average new car emissions in the UK fell to 138 gCO$_2$e/km, down from 190 gCO$_2$e/km in 1997 and a fall of 27% over the period.\(^{148}\)

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146 The transport estimate includes emissions from international aviation and shipping, but the aggregate Scottish emissions estimate used here does not take account of the EU emissions Trading System.
147 This is an internal calculation using Scottish Transport Statistics figure for vehicle kilometres and Scottish emissions data from the National Atmospheric Emissions Inventory (NAEI).
148 SMMT. Average new car CO2 emissions: [www.smmt.co.uk/co2report/#](http://www.smmt.co.uk/co2report/#)
7.4 Four packages for decarbonisation

7.4.1 Our transport contribution is set out in four packages:

- decarbonising vehicles;
- road network efficiencies;
- sustainable communities; and
- business engagement around sustainable transport.

7.4.2 Policies and proposals covering Scotland’s transport emissions are anticipated to reduce emission by 4.1 MtCO₂e to 10.5 MtCO₂e.

Package 1 - Policies and proposals to decarbonise vehicles

Policies

7.4.3 EU Directives make significant contributions to emissions reductions. The EU Directive on carbon dioxide from cars requires new car fleet average emissions to be 130 gCO₂e/km by 2015 with a target of 95 gCO₂e/km by 2020. For vans, there is a 175 gCO₂e/km by 2017 and 147 gCO₂e/km by 2020.\(^\text{149}\)

7.4.4 We support UK Government efforts to press the European Commission for higher **vehicle emissions standards beyond 2020** to deliver further improvements in conventional vehicle efficiency and to provide certainty on future markets for ultra-low carbon vehicles. For new cars, the UK Government considers a range of emissions between 50 gCO₂e/km and 70 gCO₂e/km in 2030 to be plausible and, for vans, a range of between 75 gCO₂e/km and 105 gCO₂e/km.

7.4.5 The **EU biofuels target** is implemented through the **UK Renewable Transport Fuel Obligation**\(^\text{150}\) (RTFO). Currently, it seems unlikely that biofuels will make up more than 10% of transport fuel by volume by 2020. Biofuels could, though, have a role in market segments where there is limited scope for emissions cuts through electrification, for example in relation to conventional cars and vans, buses and coaches, and HGVs (HGV diesel already meets the RTFO).

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Proposals

7.4.6 The interventions below are treated as proposals for emissions accounting purposes. This is because, while in most cases they are already being taken forward, they are not yet being implemented at the intensity required for the abatement figures in this document.

7.4.7 The CCC suggests that by 2020, at least 5% of the car fleet should be electric vehicles (16% of new car sales) in order to provide the ‘critical mass’ for subsequent roll-out. This would amount to 120,000 vehicles with new car sales of around 27,000.\textsuperscript{151}

7.4.8 Our work in the coming years will focus on decarbonising vehicles, particularly through fleet conversion to electric vehicles (EVs), and in the public sector, as well as supporting electric vehicle infrastructure. Industry will have a key technology role in this by increasing battery ranges and reducing their costs, while manufacturers are expected to develop alternative ownership models for consumers.

7.4.9 We are now in our third year of funding the installation of EV charging facilities and participating in the Department for Transport (DfT) via its offshoot organisation the Office of Low Emission Vehicles (OLEV) - UK Plugged-in Places initiative. The programme will see the installation of a high powered interoperable network of charging facilities across Scotland’s seven cities and primary road network together with commercial workplace and home charging facilities. By the end of 2012-13, expenditure on EV charging infrastructure and EVs for all of Scotland’s community planning partnerships will total £9 million.

7.4.10 By the summer of 2013 we are aiming for a network of over 500 double outlet charging posts, of which over 300 will be publically available across Scotland. This, ultimately commercial, network is to be known as ‘Charge Place’ Scotland. Our Low Carbon Vehicle Procurement Programme\textsuperscript{152} has enabled the purchase of low carbon vehicles as well as supporting the change of public attitudes towards these vehicles by increasing their visibility.

\textsuperscript{151} Assuming new car sales and fleet size on a par with 2011 figures. In reality, new car sales and fleet size are likely to be marginally above the 2011 level so absolute sales are likely to be higher.

\textsuperscript{152} Low Carbon Vehicle Procurement Programme: www.transportscotland.gov.uk/road/sustainability/low-carbon-vehicles
7.4.11 We are reliant on the development programmes of various vehicle manufactures who are, in European terms, only releasing low carbon vehicles for sale in spring/summer 2013 and onwards. This should result in greater opportunities for society to purchase vehicles. Our ‘Charge Place’ charging infrastructure will be ready for use in addition to undergoing further roll out to improve its availability across all of Scotland.

7.4.12 As other technologies emerge and become credible options we will take steps to promote them. We have identified further projects at key locations to reduce carbon from transport, including LNG (liquid natural gas), inductive charging technology for fleet vehicles and hydrogen to help tackle emissions from HGVs and public service vehicles.

7.4.13 The E-cosse Partnership, initiated by Transport Scotland and WWF Scotland, is a collaboration involving industry, government and other key stakeholders to advance adoption of EVs in Scotland. Its approach acknowledges that whilst government can put in place relevant policy frameworks, stakeholder support for areas of the work is essential. For example, industry has a critical role through its development work on technology issues such as increasing battery range and reducing their costs (costs can currently be prohibitive for some buyers), while manufacturers are expected to develop alternative EV ownership/leasing models for consumers.

Electric vehicles and the grid

The adoption of EVs has implications for Scotland’s power transmission and distribution networks although, in practice, this will depend on the way consumers use and charge their vehicles (e.g. home night time charging versus daytime charging at public or commercially owned charge points).

The role of EVs in utilising 'excess' renewable energy, and helping to balance variations in demand for electricity over time as part of a smart energy grid, is already being implemented by the installation of the most powerful charging equipment possible (7 Kw) in homes (to be used at night) and the same capacity facilities in cities' short stay daytime parking facilities.

High powered facilities are reserved for the primary road and ferry networks for longer journeys being undertaken. Wider aspects are being considered in the EV Roadmap being produced through the E-cosse partnership. Increased electricity tariffs could potentially be levied at times of peak demand to further encourage EV charging off-peak.
7.4.14 In addition to work on producing the 2013 Roadmap setting out how its aims will be achieved, other elements of E-cosse comprise:

- The E-cosse Strategic Board, a forum of leaders from government, industry and other stakeholders. It first met in October 2012, chaired by the Minister for Transport and Veterans and co-chaired by Gordon McGregor, Energy and Environment Director at Scottish Power; and

- E-cosse Readiness initiatives which will establish a portfolio of projects to advance EV adoption and implement the recommendations of the roadmap

Buses

7.4.15 Buses account for 6% of Scotland’s surface transport emissions. Our Scottish Green Bus Fund,\(^\text{153}\) launched in 2010, is helping our bus industry invest in the latest emission reducing technology and demonstrates our commitment to its future. Our support targets the price difference between a LCV bus and its diesel equivalent. Our aim is to improve air quality, accessibility and encourage modal shift.

7.4.16 A market penetration of 50% hybrid buses by 2027 is thought to be achievable, provided the technology improvements continue to remove the price differential between hybrid and diesel engines. Towards the end of this period, hybrid bus engines are expected to become cost competitive with diesel engines. This transformation is an important opportunity for the Scottish bus manufacturing sector which is led by Alexander Dennis of Falkirk.

7.4.17 Following a revision in the Bus Service Operators Grant methodology, grants to operators to support the network and keep fares down are based on distance rather than fuel consumption, increasing incentives for fuel efficiency and thus rewarding environmentally efficient operations as well as supporting the extent of the bus network. Additionally, LCVs receive double the standard rate. Further, local authority actions around the permitted vehicle types in air quality zones could further encourage low carbon transformation.

Hydrogen Buses

The Aberdeen Hydrogen project being led by Aberdeen City Council and SSE will see ten hydrogen buses operate on routes within central Aberdeen. This will be the largest fleet of hydrogen buses in Europe. They should be on First and Stagecoach bus routes by 2014 and will be refuelled at Scotland’s first large hydrogen refuelling station, which will also be able to fuel hydrogen powered cars.

In the second phase of the project, SSE will develop a whole hydrogen system, which will harness wind energy to produce and store hydrogen, which can then be used to fuel vehicles and other uses such as generating electricity at times of peak demand.

The Scottish Government and Scottish Enterprise have each committed up to £1.65 million to support the project, which has a total budget of £22.5 million, has also received funding from the European Commission, the UK Technology Strategy Board and NESTRANS. Other partners include Aberdeen Renewable Energy Group, Ballard, BOC/Linde, Element Energy, Scotia Gas Networks and Van Hool.

7.4.18 In the coming years we will support hydrogen pilot projects as with the example in the box above.

Maritime transport

7.4.19 While emissions from ferries are relatively small, it is important to drive them down. Subject to capital availability, our Ferries Plan, published in December 2012, sets out a major programme of vessel investment, including fuel efficiency improvements, from 2015. We are considering the scope for more efficient powering of vessels while in port through connection to shore-side power sources and the use of port sites for renewable power generation.

7.4.20 We are also working with operators and the port sector on the environmental impact of maritime transport. This work includes emissions reduction from improved vessel design, hybrid diesel-electric engines (especially for ferries) and use of other alternative fuels, and improved fleet management. Improvements to the efficiency of the subsidised fleet as a whole are dependent upon the pace of vessel replacement.
7.4.21 Over the period 2027-2050, we expect many new low-emission ferries to be introduced. We are currently providing over £20 million to our asset-owning company, Caledonian Maritime Assets Ltd (CMAL),\textsuperscript{154} for the construction of two hybrid ferries which will be equipped with both conventional diesel engines and batteries which will be charged overnight from the grid.

7.4.22 Liquid Natural Gas may also contribute to maritime emissions abatement, with potential usage for one or perhaps two generations of vessels as part of the transition to the low carbon ferries.

7.4.23 We also support efforts for an international agreement on carbon emissions from shipping.

**Aviation**

7.4.24 The EU is responsible for the main policy lever for addressing aviation emissions, through the EU ETS, under which emissions from both domestic and international aviation are capped. In 2012, emissions were capped at 97% of average annual emissions from 2004–2006, and from 2013–2020 they will be capped at 95%.

7.4.25 In support of an agreed international position on aviation emissions the European Commission has instigated a ‘stop the clock’ proposal that will result in the exclusion of flights into and out of Europe from the ETS until September 2013. If sufficient progress is made as part of these international negotiations then this will continue post September. The International Civil Aviation Organisation is taking forward these negotiations and Scotland is feeding into the discussion through the UK’s negotiators. European aviation emissions will continue to be included in the scheme for domestic flights and flights to and from European nations.

7.4.26 We endorse the on-going aviation Clean Sky\textsuperscript{155} partnership between the European Commission and industry which, with a grant budget of some €1.6 billion, will speed up technological advance. Biofuels also have potential to deliver a step-change in the environmental performance of aviation and have been used on a number of commercial flights since June 2011.

\textsuperscript{154} Caledonian Maritime Assets Ltd: www.cmassets.co.uk/en/home.html

\textsuperscript{155} Clean Sky partnership: www.cleansky.eu/
Package 2 - Road network efficiencies

7.4.27 We will complement our work on promoting low carbon vehicles with road network efficiency initiatives such as congestion management and efficient driving.

7.4.28 Our Intelligent Transport Systems (ITS)\textsuperscript{156} and the further deployment of average speed cameras on trunk roads will encourage driving at more efficient speeds. The most efficient driving speed for cars varies but, in general, efficiency tends to decrease with speeds above 50 mph. ITS tools include variable speed limits, variable message signs, ramp metering and targeted use of the hard shoulder as an additional 'managed lane' for priority vehicles. Smoother traffic flows can also result in a reduction in emissions per vehicle and reduced fuel consumption.

Package 3 - Sustainable communities

7.4.29 The sustainable communities package aims to help people understand their options and use more carbon friendly modes of travel through travel planning, walking and cycling, and the use of car clubs.

7.4.30 By the 2020s, the concept of a sustainable community should be more of a reality than it is today given on-going work with local authorities and COSLA to develop approaches to providing and promoting sustainable transport options. The proportion of people commuting to work each day could be lower as a consequence of both digital technologies and low carbon behaviours and values.

7.4.31 We, with partners, will continue to develop community-based travel planning strategies in light of learning from the joint £15 million Smarter Choices Smarter Places (SCSP) demonstration programme\textsuperscript{157} that ran in seven local areas between 2008 and 2012, as well as from other similar initiatives. There is a significant role for local authorities in delivering both behaviour change and infrastructural improvements (e.g., traffic calming and local road re-design). In addition, advice on travel choices (including vehicles-type) is available to members of the public from the network of Energy Saving Scotland Advice Centres.

\textsuperscript{156} Transport Scotland. Intelligent Transport Systems: \url{www.transportscotland.gov.uk/road/technology/intelligent-transport-systems}

\textsuperscript{157} Transport Scotland. Smarter Choices Smarter Places: \url{www.transportscotland.gov.uk/roads/sustainable-transport/funding-for-projects/smarter-choices-smarter-places}
7.4.32 Improvements in integrated public transport such as smart ticketing, and park-and-ride facilities, will support further modal shift to bus\textsuperscript{158} and rail\textsuperscript{159} and away from private car usage, particularly where complemented by local travel planning. Local authorities have key roles in establishing Bus Quality Contracts and statutory bus partnerships as ongoing measures to attract new passengers by improved bus service delivery. We are working with the Bus Stakeholder Group to identify and tackle any barriers to wider take up of bus quality contracts and partnerships. Integrated ticketing and smartcards also have potential to increased travel by public transport especially as connectivity steadily improves.

7.4.33 In addition, work by bus operators and local authorities on interactive information boards within bus stops, with real time information on services, will develop confidence in public transport. Hand held devices such as smart phones, with access to similar information, offer the potential to limit time spent waiting for buses at stops - seen as one of the major costs of using public transport.

7.4.34 Our Cycling Action Plan\textsuperscript{160} sets out our plans for achieving our vision that by 2020, 10% of all journeys in Scotland will be taken by bike. Our active travel policy beyond 2020 will continue work to substitute cycling and walking for car journeys of up to 5 miles, with on-going work with stakeholders to deliver further infrastructure improvements and promote active travel for shorter journeys. Scottish Ministers’ intention to develop a National Walking Strategy\textsuperscript{161} was announced in May 2012.

7.4.35 We will also continue to work with partners to develop the network of car clubs\textsuperscript{162} across Scotland. Around a dozen have been developed to date and more are in development as communities recognise the potential cost-savings and convenience from car-sharing over car ownership. Car club vehicles are generally at the lower end of the emissions range for conventional vehicles and so car club journeys compare favourably in terms of average emissions per mile. Scottish car club vehicles are, on average, 29% more fuel efficient than the average car in the UK. Car clubs offer an opportunity to pilot the use of EVs in communities and this will be

\textsuperscript{158} Transport Scotland. Bus Policy: \url{www.transportscotland.gov.uk/public-transport/Buses/Policy}
\textsuperscript{159} Transport Scotland. Rail Policy: \url{www.transportscotland.gov.uk/rail}
\textsuperscript{160} Transport Scotland. Cycling Action Plan for Scotland: \url{www.scotland.gov.uk/Publications/2010/06/25103912/0}
\textsuperscript{161} National Walking Strategy: \url{www.scotland.gov.uk/News/Releases/2012/05/walkingstrategy17052012}
\textsuperscript{162} Car Clubs in Scotland: \url{www.carplus.org.uk/our-work/car-clubs-in-scotland/}
developed in the coming years. Car clubs should become self-sustaining over time given their financial attractiveness to members.

**Package 4 - Business engagement on sustainable transport**

7.4.36 Businesses and organisations are significant generators of travel, with 10% of average annual travel accounted for by business activity.\(^\text{163}\) This travel represents significant costs to businesses. The package of interventions includes the on-going roll-out of fuel efficient driving,\(^\text{164}\) workplace travel planning\(^\text{165}\) and freight efficiencies.

7.4.37 Through the “ChooseAnotherWay” website hosted by Energy Saving Trust on behalf of Transport Scotland, we are supporting workplace travel-planning to identify alternatives to travel (through the use of technology) and lower-carbon alternatives to current strategies, including promotion of alternatives to travel (smarter working). We are also researching the impacts of the Worksmart\(^\text{166}\) initiative and similar projects being undertaken by local authorities and organisations to reduce work-related travel and lever significant financial benefits as well as carbon abatement.

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**ChooseAnotherWay**

The chooseanotherway.com website is a resource centre for organisations in Scotland wanting to reduce the costs and environmental impacts associated with how we work and travel. It is hosted by the Energy Saving Trust on our behalf, and was developed in partnership with the 2020 Climate Group.

Mobility and the way we travel to the workplace, to meet clients, to transport goods and as part of daily operations can be a significant cost, source of emissions and area of corporate and occupational risk for organisations. The approaches provided will help businesses and organisations identify cost effective strategies for tackling travel-related issues, unlock benefits and achieve greater business efficiency and resilience. The website also provides knowledge-sharing opportunities through a series of webinars.

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\(^\text{163}\) This excluding commuting which accounts for an further 20% of annual individual travel.

\(^\text{164}\) Fuel Efficient Driving: [www.energysavingtrust.org.uk/scotland/Travel/Driving/Fuel-Efficient-Driver-training](http://www.energysavingtrust.org.uk/scotland/Travel/Driving/Fuel-Efficient-Driver-training)

\(^\text{165}\) Workplace Travel Planning: [www.chooseanotherway.com/](http://www.chooseanotherway.com/)

\(^\text{166}\) Worksmart initiative: [www.flexibility.co.uk/cases/Aberdeenshire-Council-Worksmart.htm](http://www.flexibility.co.uk/cases/Aberdeenshire-Council-Worksmart.htm)
7.4.38 We are encouraging **fleet efficiency** improvements through promoting fuel efficient driving practices - for cars, vans and HGVs - and the application of vehicle telematics, as well as sign-posting opportunities for fleet conversion through green fleet reviews and work to help organisations identify the opportunities for reducing grey fleet costs.

7.4.39 We will continue to work with the haulage sector on alternatives to road haulage (freight modal shift to rail and water)\(^{167}\) and encourage more efficient freight vehicle usage\(^{168}\) (fuel efficient driving practices for HGVs and vans, fuels, encouraging load sharing and consolidation etc. )

**Lower emission potential in Transport**

7.4.40 A range of models used to predict transport emissions suggests that it may be possible to reduce predicted emissions, perhaps by as much as 0.75 Mt by 2027. This potential reflects uncertainties in projections of traffic growth; and the scope to manage reductions in use of the road network in favour of public transport and improved travel planning. This is not a short-term requirement and we would aim for an appraisal in RPP3 on realising this potential over the period 2025-27.

7.5 **Supporting and enabling measures**

7.5.1 **Scottish Planning Policy** influences the location, density and form of development to make access by public transport and active travel easier and reduce travel demand. It can also influence the accessibility of infrastructure for mobile phone technology, Wi-Fi and broadband.

7.5.2 Communities will benefit from the impacts of our **Digital Strategy**\(^{169}\) allowing more opportunities for dispersed tele-working from home and community facilities, potentially reducing commuting and associated traffic/public transport congestion. Business and leisure travel emissions and costs should fall as more services, including shopping and public services, are accessed digitally.

7.5.3 We are implementing a wide range of **infrastructure investment plans**, geared to support sustainable economic growth in Scotland, which will encourage modal shift to public transport and active travel. We are

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committed to Fastlink in Glasgow, supporting the Glasgow Subway modernisation and Borders Rail, and supporting the Edinburgh trams, as well as work linked to the Forth Replacement Crossing around Park & Ride and dedicated busways.

7.5.4 In 2012-13 we are investing **over £1 billion in public transport and other sustainable transport options** to maintain the network and encourage people out of their cars. In June 2012 we announced a £5 billion package of funding and investment in Scotland’s railways between **2014 and 2019** including a commitment to further electrification of the rail network.

7.5.5 Although Scotland does not feature in the UK Department for Transport’s plans for high speed rail, Scottish Ministers have agreed a programme of joint working with the UK Government for high speed rail between the North of England and Scotland. These plans will be presented in 2015. Scotland’s inclusion adds to the economic case for high speed rail in the UK. It will also encourage modal shift from the UK’s busiest domestic aviation market, between Scotland’s central belt and London. A three hour journey time would potentially capture two-thirds of the overall Scotland to London travel market, and deliver reductions in carbon emissions from modal shift from air to train.

7.6 Costs and benefits

7.6.1 The costs of the interventions described above are largely derived from the MTCCI report\(^{171}\) on which our RPP1 analysis was founded. We have built on the work using updates from additional publications, including the CCC’s Fourth Carbon Budget report.\(^ {172}\)

7.6.2 A significant proportion of the up-front funding required to implement many of these policies is likely to fall to the public sector. However, in general, the measures should bring financial benefits greater than their costs. Fuel efficient driving will bring fuel-cost savings for households and businesses, as well as a strong possibility of fewer traffic accidents. Modal shift to active travel should also provide financial savings to individuals. Car club membership can reduce the requirement for car


\(^{171}\) Mitigating Transport’s Climate Change Impacts: [www.scotland.gov.uk/Publications/2009/08/26141950/0](http://www.scotland.gov.uk/Publications/2009/08/26141950/0)

\(^{172}\) Committee on Climate Change. Fourth Carbon Budget: [www.theccc.org.uk/reports/fourth-carbon-budget](http://www.theccc.org.uk/reports/fourth-carbon-budget)
ownership, while offering households and organisations access to lower cost car usage.

7.6.3 On top of the financial benefits, most of the policies and proposals will bring additional benefits such as improved health, improved air quality, less congestion and noise pollution, and enhanced biodiversity.

7.6.4 The decarbonisation agenda offers a real opportunity to re-focus Scotland's expertise in high value manufacturing into a new, dynamic and rapidly growing global market for low carbon vehicles and vessels. Although Scotland has no major car manufacturing industry, Scottish companies have capability in niche vehicle manufacturing and are bringing prototypes to market. These companies include Allied Vehicles Ltd (EVs), Axeon (lithium-ion batteries) and Alexander Dennis Ltd (hybrid buses). The uptake of EVs will also support opportunities related to large scale transition to renewable energy generation. In addition, the £20 million contract for new hybrid ferries has been awarded to the Ferguson Group.

7.6.5 Taking account of forecast costs for petrol and diesel and the relative fuel efficiencies of conventional and electric cars, electric vehicles should over time become significantly cheaper to run than conventional vehicles. This could stimulate increased vehicle usage, thus congestion, which would need to be tackled through traffic management.

7.6.6 The provision of additional cycling and walking infrastructure can be labour intensive relative to larger infrastructure projects, thus creating construction work for locally-based contractors. Jobs may also be created in bike shops, supply chains and leisure and tourism outlets as well as in relation to cycle training provision and promotion. Increased participation in active travel, in addition to car and lift sharing, can also help alleviate transport poverty issues by widening the low-cost low-carbon travel options available.

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173 Allied Vehicles Ltd: [www.alliedelectric.co.uk](http://www.alliedelectric.co.uk)
174 Axeon: [www.axeon.com](http://www.axeon.com)
176 Ferguson Group: [www.fergusongroup.co.uk/shipbuilding/profile.aspx](http://www.fergusongroup.co.uk/shipbuilding/profile.aspx)
Highlights of progress to date

Through our Low Carbon Vehicle Procurement Support Scheme, and membership of the UK Government’s Plugged in Places, we have invested £9 million in LCVs and charging infrastructure over 2010-11, 2011-12 and 2012-13. Scotland’s public sector has purchased around 270 LCVs including cars, vans and street sweepers, and installed over 500 charging posts.

Since 2010, the Green Bus Fund has provided support of £5.8 million to eight bus operators for the purchase of 71 new hybrid buses. Each new bus is expected to produce 30% less emissions and require 60% less fuel than a diesel bus, to deliver an average emissions reduction of around 21 tCO₂e per year or 300 tCO₂e over its life-cycle.

A further £3 million for a third round of the Fund was announced in August 2012. The current round has attracted bids from five operators for funding to allow purchase of an additional 45 LCVs. If approved, these bids will receive grant totalling £2.5 million, bringing total grant under the Fund to approximately £8.3 million. Thus, the Fund will have provided support for a total of approximately 116 green buses, achieving an estimated reduction of emissions totalling 36 ktCO₂e over the life cycle of the vehicles.

Cycling. We are continuing to support local authorities and stakeholders in their efforts to encourage active travel by our investment of additional funding over the next three years of £13 million, announced in February 2012, with a further stimulus of £6 million in September 2012. On 2 January 2013, we announced a further £3.9 million investment over the next two financial years. This financial commitment also supports year-on-year increases in the percentage of school children receiving on-road cycle training and a major road safety campaign aimed at vehicle drivers. There is potential to achieve greater returns from investment in this area by exploring any possible opportunities to incorporate cycle way improvements in roads projects.
### 7.7 Transport - abatement summary

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<td>-</td>
<td>121</td>
<td>462</td>
</tr>
<tr>
<td>Network Efficiencies</td>
<td>-</td>
<td>36</td>
<td>32</td>
</tr>
<tr>
<td>Lower Emission Potential in Transport</td>
<td>2025</td>
<td>0</td>
<td>750</td>
</tr>
</tbody>
</table>

\(^{177}\) As the four packages of transport proposals comprise a number of individual measures, see the Technical Annex published with this draft RPP2 for further information on start dates.
8. Waste and resource efficiency

8.1.1 This chapter addresses greenhouse gas emissions that arise from waste. When organic materials break down in landfill sites they produce potent greenhouse gases, mainly methane which is 27 times more potent than carbon dioxide. Over 92% of territorial emissions in the waste sector arise from landfill.

8.2 Our ambitions for decarbonising waste

8.2.1 We published our Zero Waste Plan in 2010, setting out our vision for a zero waste society; a society where waste is a valuable resource, landfill is phased out, and increasing amounts of materials are reused or recycled, leaving only limited amounts to be treated. This is complemented by actions to progressively design out avoidable waste from our economy.

8.2.2 The Zero Waste Plan sets waste management targets including:

- the proportion of household waste and subsequently recycled, composted and/or prepared for re-use. The targets are 40% by 2010, 50% by 2013, 60% by 2020 and 70% by 2025 respectively;

- recycling 70% of all waste (including commercial and industrial waste) by 2025; and

- reducing the proportion of total waste sent to landfill to a maximum of 5% of all waste by 2025.

8.2.3 By 2050, we aim to achieve full recycling of our waste; landfill will no longer be necessary, and waste as we know it will have been designed out of our economy and way of life. Scottish companies will not only be reprocessing recycled materials for new products, they will be at the forefront of changes to manufacturing and retail that will have transformed how goods and services are provided to the public (Figure 8.1).

8.3 Where we are now

8.3.1 In 1999, Scotland produced 14.6 million tonnes of waste, with around 10.9 million tonnes going to landfill and less than 5% recycled.

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178 The Zero Waste Plan: www.scotland.gov.uk/Publications/2010/06/08092645/0
Today our recycling rate is over 40% and we have reduced the total amount of waste sent to landfill by 58% i.e. 6.3 million tonnes (2010-11).

8.3.2 In 1990, Scottish emissions from waste management were 5.8 MtCO₂e. In 2010, waste contributed 2.2 MtCO₂e or 4% of total Scottish emissions\(^{179}\). The combined effect of reduced waste to landfill and action to mitigate or capture landfill gases meant emissions had fallen to 2.1 MtCO₂e, a fall of more than 68%.

Figure 8.1: Zero Waste- a more circular model of resource use

8.4 Decarbonisation policies

8.4.1 Landfill gas is the main waste related contributor to our territorial greenhouse gas emissions. In 2012, the Scottish Parliament passed the Waste (Scotland) Regulations 2012\(^{180}\). These regulations introduced measures to transform how waste and recyclables are processed in Scotland. Specific measures introduced by the regulations include:

- a requirement for businesses to present dry recyclables (metals, plastics, paper, card and glass) and food waste for collection;

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\(^{179}\) Scottish Greenhouse Gas Emissions 2010:  
[http://www.scotland.gov.uk/Publications/2012/07/9583](http://www.scotland.gov.uk/Publications/2012/07/9583)

\(^{180}\) The Waste (Scotland) Regulations 2012:  
• a requirement on local authorities to provide householders with a collection service for dry recyclables and food waste;

• a ban on materials collected separately for recycling going to landfill or incineration; and

• introducing a ban on biodegradable municipal waste going to landfill by the end of 2020.

8.4.2 These regulations will progressively change both the amount and composition of waste going to landfill. The combined effect of these regulations will be to reduce annual emissions from landfill by 214 ktCO₂e in 2027.

Global pressures on resources

By 2050, we will share our planet with two billion more citizens. Furthermore, estimates indicate that three billion new wealthier consumers will enter the global market by 2030. Business and global economies may thrive on providing for these new demands, but they will place further strains on natural resources. Demographic and consumer trends are already heightening global competition for a range of resources. Prices of food, non-food agricultural items, metals, and energy are at a higher level than at any time in the past century. These trends are already affecting businesses.

In a recent survey over 80% of chief executives of manufacturing companies said that raw materials shortage was a risk to their business in 2012. While we expect these pressures to lead businesses to look much harder at their processes to reduce reliance on materials, we are working to insulate our economy from such resource pressures and to take advantage of the economic opportunities they will bring.

8.5 Using waste to generate energy and reduce emissions

8.5.1 Waste has the potential to be a considerable source of energy. For instance, if all of the estimated two million tonnes of annual food waste in Scotland was used in anaerobic digestion, it could generate enough electricity to power a city the size of Dundee, while also producing fertilisers that meet 10% of our arable farming needs.

8.6 Decarbonising proposal

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8.6.1 We are examining opportunities for capturing gas from closed or inactive landfill sites. Methane capture can be economically viable and incentives, such as the renewable obligation certificates\textsuperscript{182}, already provide financial support to landfill operators. However, once landfill sites close the capture rates are generally too small to make investment in gas capture infrastructure viable.

**Energy from waste**

In 2010, the Sustainable Development Commission\textsuperscript{183} reported that energy from waste could contribute around 3\% of Scotland’s total heat and electricity demand. The study focused on the use of combustion and anaerobic digestion with biogas capture and the main technologies that could contribute to these outputs. It emphasised that the greatest output could be achieved if thermal output is used for heat, as this would be more than 80\% efficient. Thermal only output could equate to around 6\% of Scotland’s existing heat demand.

These opportunities need to be set against the Scottish Government’s policy of continually reducing Scotland’s residual waste and minimising the need for residual waste treatment through increased rates of recycling and reuse, and waste prevention.

8.6.2 Through Zero Waste Scotland\textsuperscript{184}, we are mapping out opportunities for enhanced gas capture across Scotland. The final report will provide the basis from which to make the future policy decisions required to achieve the abatement potential.

8.7 **Supporting and enabling measures**

8.7.1 The Zero Waste Plan is an economic strategy: it aims to maximise the value of all the material resources we use in our economy, helping to create new business opportunities as well as helping businesses and local authorities find savings in how they use materials and manage their waste.

8.7.2 At the heart of these changes is a shift toward a more circular model of resource use and economic growth that ultimately designs waste out of

\textsuperscript{182} Renewables Obligations:  


\textsuperscript{184} Zero Waste Scotland:  
[www.zerowastescotland.org.uk/](https://www.zerowastescotland.org.uk/)
our economy (Figure 8.1). This isn’t simply about using less and recycling more. It’s about supporting new forms of manufacturing, redesigning products and packaging, reshaping supply chains and stimulating innovative new ways to transform recyclables into new, higher value materials. The opportunities stretch across all sectors, from the motor industry through to retail and farming.

**Changeworks Recycling’s Business Recycling Services - Our Dynamic Earth**

Changeworks Recycling carries out free and bespoke waste audits for all clients to enable them to engage with the waste they produce. An audit carried out for Dynamic Earth enabled it to focus in on a number of key waste reduction areas, and to understand how working practices could be changed to divert food waste from landfill.

To inspire staff Changeworks arranged a visit to the Scottish Parliament to allow Our Dynamic Earth staff to see food waste recycling operations. This provided Dynamic Earth with the knowledge and techniques to embed new waste reduction techniques, resulting in a 300% increase in food waste recycling.

**Behaviour change**

8.7.3 Section 3.5, earlier in this document, discusses the important role of understanding and influencing behaviour in meeting our climate change targets. The required shift in how materials are used in our economy needs a step change in our behaviour toward valuable items often discarded as waste. A key element of our national engagement is through our Greener Scotland campaign which aims to motivate collective action to help make Scotland a cleaner, greener place. A recent focus of this campaign has been preventing food waste and future campaign work will focus on recycling Scotland’s food waste.

**Market development**

8.7.4 Through Zero Waste Scotland and the enterprise agencies we are working to encourage investment in new forms of infrastructure to increase ‘closed-loop’ recycling of materials and to support increased reuse/repair of products. This includes:

- investing £6 million in Scotland’s anaerobic digestion capacity;
• supporting the development of new plastics reprocessing infrastructure through loan and capital grant funds;

• developing the evidence base for reprocessing of materials including nappies, end of life vehicles and tyres; and

• providing funds to support innovation and investment in leading edge technologies.

Resource efficiency

8.7.5 Using materials more efficiently and preventing waste is fundamental to addressing the carbon impacts. Zero Waste Scotland already provides advice and support to many businesses to help them improve their resource efficiency. From April 2013, the new single Resource Efficient Scotland service will provide a more accessible integrated business and public sector energy and resource efficiency service with a focus on implementation to maximise the carbon and financial benefits of resource efficiency actions.

Waste and global carbon emissions

8.7.6 In 2011, we introduced a world leading Carbon tool\textsuperscript{186} for measuring benefits of recycling over landfill. The tool not only looks at the avoided methane emissions from landfill, it assesses the “life-cycle” carbon emissions created from the production and consumption of materials, and calculates that amount of carbon saved through recycling those materials instead of relying on new raw materials. The tool is currently being updated to allow us to examine the global carbon benefits of all actions taken in Scotland to recycle, reuse or prevent waste.

8.8 Costs and benefits

8.8.1 The overall cost of managing the implementation of the Zero Waste plan and the Waste (Scotland) Regulations 2012 will be significantly lower than the current cost of dealing with Scotland’s waste. There is a net financial saving of the order of £17 million per year, with savings increasing to over £21 million by 2025. This amounts to a total saving of £173 million in net present value terms over the period 2013-2025.

8.8.2 Environmental benefits are estimated to be in the region of £1.4 billion (net present value) following full implementation of the Waste

\textsuperscript{186} \url{www.zerowastescotland.org.uk/carbonmetric}
(Scotland) Regulations 2012. Most of these environmental benefits are attributed to reduced global carbon emissions.

**Supporting innovation through public procurement**

By creating new markets for sustainable products and services, public procurement can play a critical role in attracting investment in new infrastructure and the creation of new supply chains for sustainable products and services.

One example would be refurbished IT and telecommunication equipment. If sections of the public sector were committed to purchasing a fixed proportion of refurbished IT and telecommunication equipment, it could help stimulate investment in new or existing sophisticated refurbishment, facilities to supply the new demand for these products in Scotland, creating new jobs and growth of an important manufacturing base. For the public sector, such investment could help create a stable supply chain of low carbon and resource efficient goods. The Scottish Government's Procurement reform work includes a series of proposals on the smarter use of public procurement to encourage innovation and growth.

8.8.3 A recent UK study estimated around 2.3% of Gross Domestic Product (GDP) could be saved through straightforward resource efficiency measures by using raw materials more efficiently and generating less waste. In 2010, that would have translated into potential savings in excess of £2.9 billion to the Scottish economy. Around half of the savings (£1.54 billion) would be made within businesses. The research also looked at longer-term best practice savings that could be achievable by 2050, giving an additional savings potential of around 5% of GDP - more than £6.3 billion on current figures.


143
**Highlights of progress to date**

The recycling and composting rate for household waste has increased from less than 5% in 1999 to over 40% in 2011.

The Waste (Scotland) Regulations 2012 are creating a step change in the availability and quality of recycling services available to homes and businesses across Scotland.

Seventeen local authorities are currently offering a household food waste collection covering approximately 665,500 properties or 28% of total households.

### 8.9 Waste and resource efficiency – abatement summary

<table>
<thead>
<tr>
<th>Waste and Resource Efficiency</th>
<th>Earliest start date</th>
<th>Annual Abatement (KtCO₂e) 2020</th>
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<tr>
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<td>Zero Waste Policies (pre May-2010)</td>
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<tr>
<td>Zero Waste Plan</td>
<td>2010</td>
<td>141</td>
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<tr>
<td><strong>Proposal</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Enhanced Capture of Landfill Gas</td>
<td>2013</td>
<td>163</td>
<td>140</td>
</tr>
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</table>
9. Rural land use

9.1.1 In this chapter, the term 'rural land use' covers agriculture and related land use, peatland restoration and forestry. Emissions in these sectors come from livestock, agricultural soils, animal wastes and certain land use changes. Importantly, some biological processes also have the capacity to absorb CO₂ from the atmosphere and store carbon in soils and vegetation.

9.2 Our ambitions for rural land use

9.2.1 Our 2009 transformational outcome was to develop a comprehensive approach to ensure that carbon (including the cost of carbon) is fully factored into strategic and local decisions about rural land use through: appropriate protection for Scotland's carbon rich soils; minimising emissions from agricultural and other land use businesses; encouraging the sequestration of carbon, for example, through woodland planting; and the use of natural resources to generate renewable energy.

9.2.2 In RPP1 we set out process and outcome milestones for supporting emissions reduction:

- Completion in 2011 of research on behaviour change in agriculture and the development of indicators to measure progress in reducing agricultural emissions.

- Incorporation of wetland management data into the net Scottish emissions account to enable peatland restoration to be counted towards Scotland’s climate change targets.

- Increase the rate of new woodland creation to an average of 10,000 hectares per year from 2015 onwards.

9.2.3 As we move towards 2027 and beyond, low carbon actions that might seem innovative now should be commonplace across the rural land use sector:

- By 2027 land managers will have further optimised the productive use of natural resources, producing food and delivering public goods, such as protecting the natural environment and reducing greenhouse gas emissions;
• With our partners, we are working to ensure that Scotland’s peatlands will be managed in ways that conserve their substantial carbon stores and biodiversity. Where peatlands have been damaged, action will be taken to prevent further damage and where practicable to restore them to a favourable condition in which they are no longer a source of greenhouse gas emissions; and

• We will create 100,000 hectares of new woodland by 2022, and agree targets for subsequent years by 2020.

9.3 Where we are now

9.3.1 Approximately 80% of Scotland is used for agricultural purposes. In 2010, emissions from agriculture and related land use accounted for 19% of total Scottish emissions; 10.5 MtCO₂e, a decrease of 3.8 MtCO₂e, or 26.6% from 1990.

9.3.2 Peatlands cover about 20% of Scotland, some 1.7 million hectares, much of which have been drained or damaged in the past. They contain an estimated 1,600 million tonnes of carbon. It is estimated that 47,000 hectares of peatland have benefited from restoration measures since 1990, giving an annual saving that would amount to 0.02 MtCO₂e by 2027.

9.3.3 Scotland has some 1.4 million hectares of woodland, which equates to roughly 18% of total land area. Scotland’s woodland sequestered a net total of 9.6 MtCO₂e in 2010. Without this, total Scottish emissions would have been 17% higher. However, following a period of low historic rates of woodland planting, net carbon sequestration rates are currently reducing year on year due to the lower proportion of young trees in Scottish forests.

9.4 Decarbonisation policies

9.4.1 Our approach to reducing emissions from the rural land use sector is guided by our Land Use Strategy which sets out three objectives relating to the economy, environment and communities. These support an integrated approach to managing the competing demands we place on our

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188 http://www.scotland.gov.uk/Publications/2012/06/6894/102
190 Once wetland management activities are incorporated into greenhouse gas emissions reporting.
191 Ibid
192 http://www.scotland.gov.uk/Topics/Environment/Countryside/Landusestrategy
land resource, seeking to balance a productive land based sector and successful tourism and leisure industry, with the vital role that our land plays in maintaining Scotland’s rich biodiversity and in storing carbon.

Agriculture

9.4.2 Emissions from the rural land use sector, particularly in agriculture, are dominated by methane and nitrous oxide rather than CO$_2$, but the term “decarbonisation” is used in this report as general shorthand for reducing greenhouse gas emissions. The transition to low-emissions agriculture is being be aided by a number of linked initiatives developed and supported by the Scottish Government, as well as by industry-led action:

- **research** provides innovative and sustainable solutions and advice on improving efficiency and reducing emissions from farming systems;

- **advisory initiatives** promote sustainable farm practices focusing on resource efficiency will advise on cross-cutting benefits of on-farm action; and

- **support mechanisms** like the Scotland Rural Development Programme (SRDP) aid uptake of sustainability measures in agriculture.

9.4.3 RPP1 described our ambition to influence farming and land management practices through a programme of best practice advice and demonstration. Our **Farming For A Better Climate** programme is designed to encourage voluntary uptake of win-win actions in five key areas:

- farm energy and fuel efficiency;
- renewable energy generation;
- locking carbon into soils and vegetation;
- optimised fertiliser and manure management; and
- optimised livestock management through improved breeding and feeding practices.

9.4.4 Given the cost effectiveness of the measures in **Farming for a Better Climate**, we anticipate that better information provision will increase voluntary uptake by **around 50%** (from starting level) for most of the measures. Some of the livestock measures, particularly those relating to improved breeding practices, may experience lower uptake in the short term due to learning barriers that may make time to overcome.
Putting Farming for a Better Climate into practice

Farming for a Better Climate (FFBC) provides best practice information, including practical tutorials and workshops on four ‘climate change focus farms’ to showcase steps under the FFBC key action areas. It allows visiting farmers to see how the individual measures are being implemented on the focus farm, what business benefits these bring and consider how these might work on their own farms. In addition to the focus farms, farmer meetings and events are held across Scotland on working farms to demonstrate steps other farmers are already taking to reduce emissions. Examples of measures taken on the climate change focus farms include:

**Ross Paton, Organic Dairy Farmer, Nr Castle Douglas**

After benchmarking energy use in the dairy, Ross Paton identified a number of ways to reduce electricity use. One of the measures, retrofitting variable speed control on vacuum pumps in the dairy, could save around £5,500 over 10 years based on current energy prices.

**Robert and Jac Neill, Beef and Arable, Nr Jedburgh**

Linking GIS technology to soil sampling has allowed Robert and Jac Neill to accurately assess nutrient requirements across the farm. Precision fertiliser application will allow optimum use of nutrients and lead to improved efficiency and profitability through more uniform yields, whilst at the same time nitrous oxide emissions are reduced.

**Neil and Linsey Butler, Mixed Dairy Farm, Nr Perth**

Improved use of clover in silage fields, tailoring application of manures based on soil analyses and topping up with nitrogen, associated savings in fuel use are just some of the measures Neil and Linsey are implementing. Savings could be in the region of £10,000 with no loss of production.

**David Houstoun, Upland Beef and Sheep Farmer, Nr Blairgowrie**

Following analysis of pit silage, David was able to feed concentrates to his 1,042 ewes two weeks later than usual, and reduce the amount of feed for the remaining six weeks based on silage quality. This was a saving of just under £3,000 and nearly five tonnes of carbon with no loss of production from the farm.
9.4.5 Estimates of uptake have been taken from published work\textsuperscript{193} on behavioural responses to incentives, taking into account issues such as acceptability and costs of implementation. We are developing a monitoring framework, and we intend to survey farmers in 2013 to measure progress towards meeting uptake targets. The information we gather will inform our decision on whether regulation is necessary to secure sufficient emission savings, as discussed further in our proposals outlined in section 9.5 below.

9.4.6 Advisory activities such as FFBC and Future Proofing Scotland’s Farming\textsuperscript{194} also promote the uptake of adaptation measures, which help to increase the resilience of agriculture to climate change.

**peatland Restoration**

9.4.7 When peatlands are drained or otherwise disturbed, they are liable to lose carbon through oxidation to form CO\textsubscript{2}. Where they are in good condition, or restoration has resulted in the re-growth of sphagnum moss, they can sequester CO\textsubscript{2}. In RPP1 we recognised that **peatlands should be conserved and where practicable restored**. The Land Use Strategy also recognised the potential importance of peatlands in climate change mitigation.

9.4.8 Little drainage of peatland has been carried out in Scotland in the past two decades. Historical data about areas of restored peatland is limited, and projections of the emissions abatement potential of peatland may also be subject to revision in light of developing scientific knowledge and the outcomes of the IPCC process.

9.4.9 It is our policy to **incorporate this activity, plus the on-going restoration work across Scottish peatlands, within Scottish emissions accounting**. There is already funding for peatland conservation measures, such as moorland management, and restoration, such as peat dams, in the Rural Priorities part of the Scottish Rural Development Programme. However the rate of restoration activity needs to be stepped up. We have announced funding of £1.7 million for peatland restoration from 2012 to 2015.

9.4.10 We intend to assess the effects of these measures with a view to developing an enhanced approach to peatland restoration where possible as described further in paragraphs 9.5.9-11 below.

\textsuperscript{193} \url{http://archive.defra.gov.uk/foodfarm/landmanage/climate/documents/climate-ag-instruments.pdf}
\textsuperscript{194} \url{www.soilassociation.org/innovativefarming/futureproofingscotlandsfarming}
Emissions accounting for peatlands

The effects of drainage or of restoration to avert such effects are not included in the current Scottish Greenhouse Gas Inventory unless land use change is involved. However, at the 2011 UN Climate Change Conference in Durban, agreement was reached on the principle of allowing countries to include the effects of wetland management (which includes peatland restoration) since 1990 within their greenhouse gas emissions reporting.

The Scottish Government hosted a meeting of the Intergovernmental Panel on Climate Change (IPCC) Technical Group in 2012. This was part of the IPCC’s programme to develop Technical Guidelines for the inclusion of wetland management within national greenhouse gas inventories. Hosting the meeting provided Scottish organisations with opportunities to showcase examples of peatland restoration. The IPCC’s Technical Guidelines are expected in mid-2013 and this internationally validated methodology for estimating carbon benefits will assist us in making informed decisions about further action on peatlands. The emissions estimates used in this draft RPP2 are the best available at this time and will be shared with the IPCC Technical Group to help inform their deliberations.

Forestry

9.4.11 During the 1970s and 1980s there was a period of major forest expansion which declined in the 1990s and 2000s. As the average age of Scotland’s forests has increased, the quantity of CO₂ that they are able to remove from the atmosphere has reduced. We are taking action to reverse this trend. As a result of improvements to the Scotland Rural Development Programme and activity on the national forest estate, new woodland creation nearly doubled between 2009 -10 and 2010 -11, from 2,700 hectares to 5,100 hectares. A further significant increase was achieved in 2011-12 with a rise to 9,000 hectares.

9.4.12 In RPP1 we committed to boosting the rate of new woodland creation to 10,000 hectares per year from 2015 onwards. Forestry Commission Scotland (FCS) is continuing to promote this policy and administer grant support. Forest Enterprise Scotland is delivering afforestation on the National Forest Estate. New forest carbon regulatory mechanisms such as the Woodland Carbon Code195 will be facilitated by FCS and governed in partnership with industry stakeholders.

195 http://www.forestry.gov.uk/forestry/INFD-863FFL
9.5 Our decarbonisation proposals

9.5.1 The following Scottish proposals are being developed or are under consideration by Scottish Ministers.

Agriculture

9.5.2 One of the areas with the greatest potential to cut greenhouse gas emissions in agriculture is to optimise the use of nitrogen-based fertilisers and manures because excess fertiliser and fertiliser applied at the wrong time reacts with air and water to form nitrous oxide.

9.5.3 Our Farming for a Better Climate programme seeks to encourage best practice in nitrogen efficiency, emphasising the win-win nature, and the benefits to water and air quality of many of the steps that farmers and land managers can take.

9.5.4 The aim is to achieve a 90% uptake of nitrogen efficiency measures. We will keep this voluntary framework under review and, depending on the progress that is achieved, will consider whether measures to regulate nitrogen fertiliser use are also needed. Those farmers who adopt efficiency measures early will not be penalised by a regulatory approach. Rather, early adopters will benefit from greater farm business savings. Any action would of course also be sensitive to the level of emissions per unit of food produced. Cutting emissions in a way that could risk undermining Scotland’s food-producing sector, at a time when global population and demand for food are growing, is not the way forward.

9.5.5 Developments in technology will influence farming practices in the time period to 2027. Some measures which seem costly and/or impractical today could become widespread in the future. Although it is not possible to predict precisely, a judgement can be made of which measures may be implemented within the industry post-2020.

9.5.6 For example, a combination of an increased uptake of livestock management measures that ensure the maximum production from each animal, along with increased uptake of anaerobic digestion technology to transform animal waste into electricity and heat could contribute additional abatement in 2027.

9.5.7 Modern approaches to the use of forage legumes, such as white clover, red clover and lucerne, as well as grain legumes, have the potential to reduce emissions by lessening the amount of inorganic nitrogen needed.
The development of precision agricultural technology, such as the use of GPS, may also influence farming practices. We estimate that these activities could contribute approximately 0.3 MtCO$_2$e of additional abatement in 2027.

9.5.8 However, we acknowledge that many of the factors that will influence this outcome are largely outside the control of government, such as the pace of technological progress and the price of inputs such as oil and fertiliser. Given the number of variables, these measures are classed as proposals in this report. However, we will work with industry to consider how best opportunities such as these might be maximised.

Peatland restoration

9.5.9 We want to maximise the ecosystem and emissions benefits that restoring degraded peatland can achieve. This is an area where the science is developing, and new evidence could lead to changes in the estimated benefits, as well as the associated financial costs of carrying out restoration work.

9.5.10 We are working with Scottish Natural Heritage (SNH) to develop a Peatland Plan. The Plan will encourage partnerships with private land interests as well as action based on land designated for protection or land that is owned or managed by public bodies or environmental NGOs. Depending on the final methodology (see 'Emissions Accounting for Peatland' in the box following paragraph 9.4.10 above) and on-going work to assess the scope for projects in Scotland, it may be possible to achieve significantly greater levels of annual peatland restoration than at present. For example, if the restoration rate were increased to 21,000 hectares per annum, which would be technically feasible, abatement of 0.5 Mt CO$_2$e per year could be achieved by 2027.

9.5.11 With this technical potential in mind, the Scottish Government and SNH will be working with interested parties, represented in the Peatland Working Group (convened by the Moorland Forum). However, achieving substantial increases in the area of peatland restored will depend on collaboration with land managers. In this way, it should be possible to bring about substantial increases in the funding, both public and private, for peatland restoration. One development under consideration is a Peatland Carbon Code, which could reflect the success of the Woodland Carbon Code.

Forestry

9.5.12 Since the publication of RPP1, Forestry Commission Scotland has continued to investigate the potential for emissions abatement by
increasing the amount of Scottish timber used in the construction and refurbishment of buildings. The Committee on Climate Change has identified timber in construction as a cost effective carbon abatement technology and in its Bioenergy Review\(^\text{196}\) it published a carbon hierarchy which placed timber in construction at the top of that hierarchy.

9.5.13  Timber has the lowest embodied energy of any mainstream building material and has the potential to deliver a wide range of benefits, from the substitution impacts of replacing more energy intensive materials, to the market opportunities presented by increased demand for Scottish timber (which in turn would help to incentivise investment in woodland creation) and the future scope for production in Scotland of wood products for export. Forestry Commission Scotland is working with Scottish Enterprise, Napier University and a range of SME’s on a Wood Products Innovation Gateway research programme aimed at developing and commercialising wood products, processes and systems utilising Scottish timber. A key project is exploring the potential for manufacturing cross-laminated timber panels using Scottish soft wood.

9.5.14  Achieving these kinds of outcomes over the long-term will require more than simply promoting the benefits of timber as a construction material. The potential role of planning, building standards and building design will be considered, as must issues of competitiveness and the need to avoid perverse incentives that might encourage use of timber in inappropriate circumstances. Work also needs to be undertaken to ensure that emissions abatement can be estimated effectively, avoiding double counting.

9.5.15  Given the transformation required in both policy and practice, estimates for potential emission abatement from this proposal do not commence until 2022. However, as we develop this work we will accelerate progress wherever possible.

**Additional technical potential from low carbon land use**

Modelling work suggest that there is an additional technical abatement potential of approximately 0.75 MtCO2e in 2027 from changes to land use involving measures such as restoration of peatlands and investment in woodland creation (e.g. Woodlands In and Around Towns). There may also be potential for adoption of additional low carbon agricultural practices. These changes will deliver emissions abatement and wider environmental

\(^{196}\) [http://www.theccc.org.uk/reports/bioenergy-review](http://www.theccc.org.uk/reports/bioenergy-review)
benefits in 2025-27. We intend to produce a detailed proposal in RPP3 on how we may realise this potential over the period 2025-27.

9.6 Supporting and enabling measures

9.6.1 Together with the other UK administrations, the Scottish Government is supporting research projects to improve the accuracy and resolution of the part of the Greenhouse Gas Emissions Inventory that estimates emissions from agriculture, land use, land use change and forestry. The outcome of this work will be advanced greenhouse gas emission factors and farm practice data with which to calculate a more accurate emissions baseline and better forecast the outcomes of proposed policy measures. With an improved inventory and evidence base, the agriculture and other land use industries will be better equipped to assess progress, and focus emission reduction activity where it is needed and most effective.

9.6.2 We are also working with the other UK Administrations to reduce and eventually **phase out the use of peat in horticulture**. Three million cubic metres of peat a year are sold in the UK, most of it imported. Scotland's share is estimated to be 10%. 500,000 cubic metres of peat were extracted in Scotland in 2009 (the output varies with the dryness of the summer), and the effects are counted as part of Scotland’s greenhouse gas emissions, amounting to 0.1 Mt CO2e. If such peat were to be sourced from other countries, the quantity extracted would be recorded elsewhere; real improvement requires the marketing and distribution of alternatives to peat in horticulture. Sites from which peat has been extracted can be restored in many cases, but this may require work over several years.

9.6.3 In response to the Woodland Expansion Advisory Group's recommendations (see paragraph 9.6.9 below) and building on improvements in planning guidance such as FCS’s 'Right Tree in the Right Place' (2010), a series of regional and sub-regional **approaches to understanding woodland creation constraints and opportunities** are being piloted in partnership with local authorities and other public sector bodies. Alongside this, there will be an enhanced role for Regional Forestry Forums in providing FCS and local authorities with advice. This will include opportunities for implementation of Forestry and Woodland Strategies as well as the implications of woodland creation for other land-based objectives.

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9.6.4 In recent times, Scotland’s trees have been faced with an increase in the instances of new pests and diseases. Advice from Forest Research indicates that climate change may create the conditions for even more pest and disease activity and these heightened threats require us to take a strategic approach to forest and tree health given the importance of woodlands for carbon storage and to the commercial timber sector. Action is being coordinated across the UK as part of the Forestry Commission’s Biosecurity Strategy. This aims to preserve the health and vitality of our forests, trees and woodlands by excluding, detecting and responding to existing and new pests, whether of native or exotic origin.

9.6.5 The wood fuel market for renewable power and heat has developed rapidly over the last five years largely because of support for biomass electricity and combined heat and power (CHP) plants under the Renewable Obligation (RO) Scotland. The Renewable Heat Incentive (RHI) is now providing significant support for the installation of biomass heat (and CHP plants) in commercial, industrial and public buildings with a household RHI to follow in 2013. We are providing additional impetus to the uptake of the RHI and encouraging better woodland management on the back of increased demand for wood fuel through regional wood fuel forums.

Review of woodland creation rates

9.6.6 In RPP1 we proposed that it might be appropriate to increase new woodland planting rates towards 15,000 hectares per year. This was subject to a number of conditions. In response to Proposal 7 in the Land Use Strategy, the Woodland Expansion Advisory Group (WEAG), with members representing the interests of agriculture, forestry, communities and the environment, was established to provide the Cabinet Secretary for Rural Affairs and the Environment with advice identifying which types of land are best for tree planting in Scotland, in the context of other land-based objectives. The WEAG published its report in 2012. It endorsed our policy of increasing the woodland creation rate to 10,000 hectares per year, recommending that the focus of activity should be on creating 100,000 hectares of new woodland between 2012 and 2022.

9.6.7 The WEAG also recommended that there should be a review, initiated no later than 2020 in order to set targets beyond 2022. We have accepted these recommendations. The need to achieve our ambitious greenhouse gas emission reductions targets should be a key factor in the review. For the purpose of estimating emissions abatement in this draft RPP2, our calculations are based on a continuation of the current

199 http://www.forestry.gov.uk/forestry/INFD-BGYKBA
200 http://www.forestry.gov.uk/weag
10,000 hectare per year policy and do not include projections for either an increased rate of 15,000 hectares per year, nor any reduced rate.

9.7 Costs and benefits

9.7.1 Improving efficiency of agriculture and related land use systems will yield financial benefits as well as supporting the transition to a low carbon economy. Due to the cost effective nature of those measures promoted by Farming for a Better Climate, the policy is estimated to result in overall reduction in costs to farm businesses of around £240 million (undiscounted over the period to 2027). These savings arise largely from productivity increases resulting from improved efficiency in input use.

9.7.2 A change to more efficient farm practices will not only reduce emissions, but will result in farm business savings and make businesses more resilient. In many cases, improvements to water and air quality, as well as biodiversity and longer-term sustainability will also have been achieved through farming which is more integrated with wider land management practices.

9.7.3 With cost savings and emissions reductions, the overall cost effectiveness of the FFBC works out on an undiscounted basis, at approximately £160 per tonne of saved emissions. Increasing the uptake of the fertiliser efficiency measures as proposed will lead to further savings as uptake increases: The overall cost effectiveness of the proposal (undiscounted with no allowance for policy costs) is estimated to be around £90/tCO₂e, i.e. a saving of £90 per tonne of saved emissions.

9.7.4 The cost of an enhanced peatland (optimised current) restoration programme of 6,500 ha/year is estimated at approximately £5 million a year, the larger part of which would be from public funds; if this was to be tripled to some 20,000 hectares a year, the cost would be around £15 million per year. There should be some private sector expenditure, for instance for projects part-funded through the SRDP.

9.7.5 Peatlands in good condition provide many ecosystem benefits. They include sites for wildlife and are valued for biodiversity. Blanket bog is protected under the Habitats Directive and is included in the UK Biodiversity Action Plan as Priority Habitat. Lowland raised bogs are less common in Scotland and many are greatly valued by their local communities, such as Langlands Moss (East Kilbride) and Blawhorn Moss, administered by Scottish Natural Heritage. Peatlands retain and filter water, thus providing benefits for both the flow and quality of water. They are valued for leisure activities, landscape and tourism.
The Milton of Mathers Woodland Project

Forest Carbon\textsuperscript{201} has developed a new woodland at Milton of Mathers near St Cyrus in Aberdeenshire on behalf of the arable farming landowner, Messrs J D Reid and Partners. The woodland creation and management is overseen by the Scottish Rural College.\textsuperscript{202} The aims of the new woodland are to reduce pollution from the nearby farm and act as a buffer to the burns, improve farm conservation and provide a safe haven for animals as well as provide access for people to enjoy them. About 1600 plants per hectare will be planted by the time the canopy closes. Over 70 years, the 17.4 hectare woodland will sequester 4.77 ktCO\textsubscript{2}e.

A combination of Scottish Government grant and private investment secured the project. The carbon capture resulting from the project is quality assured through independent verification under the Woodland Carbon Code; and details are included within the Forestry Commission’s Registry of UK Woodland Carbon Projects.\textsuperscript{203}

9.7.6 We estimate that the current programme of 10,000 hectares of new woodland creation per year could provide cumulative savings of around 2.9 MtCO\textsubscript{2}e by 2027. Further emissions savings will continue throughout the lifetime of the woodland. The cost of achieving this over the period 2013-2022 will be around £450 million and average around £57 million per year thereafter to 2027. Much of this will come from financial support through the SRDP, but there will also be additional planting on the national forest estate.

9.7.7 Opportunities for developing the market for timber construction materials lie primarily in the growing utilisation of cross-laminated timber (CLT) products. Currently, around 75% of new homes built in Scotland use timber frames CLT is a solid wood engineered product which extends timber’s attractiveness to developers beyond building frames as it can be used as walls, floors and roofs. Investment (largely private sector) in new cross-laminated timber production facilities using Scottish timber could offer an opportunity for significant market development. In this case an investment in two new plants of around £40 million by 2022 and around a further £10 million by 2025 to expand production capacity, could potentially achieve cumulative emissions abatement of the order of 450 ktCO\textsubscript{2}e by 2027.

\textsuperscript{201} Forest Carbon: www.forestcarbon.co.uk/
\textsuperscript{202} Scotland’s Rural College: www.sruc.ac.uk/
\textsuperscript{203} Forestry Commission: www.forestry.gov.uk/website/carbonregistry.nsf/byprojectid
Highlights of progress to date

In 2011, we completed research on behaviour change in agriculture and the development of indicators to measure progress in reducing agricultural emissions. “Agriculture and Climate Change - Evidence on Influencing Behaviours” is now published and available on the Scottish Government website\(^{204}\).

In 2011, we completed a scoping study to assess the current data available to measure progress in reducing emissions\(^ {205}\) and we are taking forward additional work to address the major gaps in knowledge on uptake of Farming for a Better Climate measures.

Progress towards the target to plant 100 million trees by 2015 has been good, with the level of woodland creation rising significantly over the past three years. The 9,000 hectares of new woodlands which were planted in 2011-12, put rates on track towards meeting our longer term target of an average of 10,000 hectares a year.

9.8 Rural land use abatement summary

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<td>260</td>
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<td>Additional technical potential from low carbon land use</td>
<td>2025</td>
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\(^{204}\) [www.scotland.gov.uk/Publications/2012/10/8893]
\(^{205}\) [www.scotland.gov.uk/Publications/2011/12/16110745/0]
10. Monitoring impacts and progress

10.1 Scottish Government’s Low Carbon Management System

10.1.1 Since the publication of RPP1, we have continued to develop our monitoring mechanisms to track progress in reducing greenhouse gas emissions across the main sectors in the Scottish Government.

10.1.2 Our **Low Carbon Management System** is centred on the work of the **Emissions Reduction Programme Board**. It is the responsibility of the Board to monitor progress in the areas where significant emission reductions are expected and to provide a challenge function if delivery is not as expected. The Board meets quarterly and is chaired by the Director General for Enterprise, Environment and Digital. Its members are the Directors in the Scottish Government responsible for the key sectors where emission reductions are planned and expected.

10.1.3 To support the work of the Board’s members, each Director is responsible for maintaining a report of emission reduction activities in their sector. During the development phase these documents were referred to as ‘scorecards’. Their formal title now is **Carbon Reduction Activity Reports**.

10.2 Independent assessments

10.2.1 Since the RPP1 was published, a number of independent progress/review reports have been published. In December 2011, Audit Scotland published a review report on Scottish Government’s progress in reducing greenhouse gas emissions.

10.2.2 In January 2012, the Committee on Climate Change published its first progress report on action by the Scottish Government in reducing greenhouse gas emissions.

10.2.3 One of the recommendations to the Scottish Government in the Audit Scotland report was to provide greater transparency in its Low Carbon Management System. We have acted on this recommendation in two ways:

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http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/EmissionReduction

http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/EmissionReduction/ActivityReports


To introduce greater scrutiny and challenge to the Board, we extended its membership in March 2012 to include a Non-Executive Member, James Curran, Chief Executive for the Scottish Environment Protection Agency. This external advisory function is being further developed and an additional Non-Executive Member has accepted an invitation to join the Board in 2013.

In May 2012 we published a new web page[^1] for the Emissions Reduction Programme Board within our climate change web pages. This site contains details of the Board’s meeting agendas, its meeting notes and the Carbon Activity Reduction Reports which are updated on an on-going basis.

10.2.4 In 2013 individual programmes of work will be identified for the Directors of the Board based on the policies and proposals published in the final RPP2. The Directors will be expected to report to the Board on the delivery of these activities through a new system of Check Point Reports and Exception Reports.

10.2.5 We plan to increase the scope of the Board to include a new governance and reporting role for the Scottish Climate Change Adaptation Programme, which is currently being developed. When this happens the Board is expected to change its name and expand its membership.

10.3 Draft and final reports

10.3.1 This document is a draft of the second report on proposals and policies for meeting annual targets that the Scottish Ministers must lay before the Scottish Parliament in accordance with the requirements in section 35 of the Climate Change (Scotland) Act 2009. The Act requires that the final version of this report be laid following a 60-day period for Parliamentary consideration.

10.3.2 Before laying the final RPP2, Ministers must have regard to any representations on the draft report, any resolution on the draft passed by the Scottish Parliament, and any report on the draft published by any Committees of the Parliament. After the 60-day period has ended, Ministers will lay the final version before Parliament along with a statement setting out details of any representations etc. made to them in respect of the draft and detailing any changes that have been made in response.

10.4 **Strategic environmental assessment**

10.4.1 The Environmental Assessment (Scotland) Act 2005 sets out statutory requirements for the preparation and publication of Strategic Environmental Assessments (SEA) by public bodies. The purpose of SEA is to ensure that the likely significant environmental effects of Scottish plans, programmes and strategies are assessed and taken into account during their preparation.

10.4.2 The Environmental Report is the key medium for outlining the outputs of the Strategic Environmental Assessment process. The Environmental Report on the proposals and policies set out in the draft RPP2 details the results of the environmental assessment of these measures, identifying and evaluating the likely significant environmental effects of implementing them, as well as identifying the means to prevent or avoid significant adverse effects and enhance positive ones, while also considering reasonable alternatives where appropriate.

10.4.3 The Environmental Report has been published and is available for comment during the 60-day period for Parliamentary consideration of the draft RPP2 detailed above.

10.4.4 The last output of the SEA process is the preparation and publication of an SEA Statement that sets out how the findings of the SEA have been considered, and how views expressed during the consultation period were taken into account.

10.4.5 More information about the SEA of the proposals and policies set out in this draft report, including details of the consultation on the Environmental Report, is available on the Scottish Government's website at the following address: [www.scotland.gov.uk/climatechange](http://www.scotland.gov.uk/climatechange).
### Annex A: Greenhouse Gas Business as Usual Projections and Emissions Abatement (ktCO2e) and Cost (£m) Estimates

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<td>Total Business As Usual</td>
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Up to 2020, the net Scottish emissions account will measure Scotland’s share of EU Emissions Trading System allowances. The overall number of allowances is assumed to be lower if the EU strengthens its 2020 target from 20% to 30%. Phase III of the EU ETS runs from 2013-2020. It is our proposal to review our emissions accounting methodology after Phase III and measure actual emissions from the traded sector.

Because of the change in methodology partway through the time series, this table differs from the other tables in this annex in that it presents an estimated scenario of *actual emissions* from the traded sector, which includes energy supply, rather than a projected business as usual baseline from which emissions abatement is deducted.
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163
## Business, Industry & Public Sector

**Policies (emissions abatement ktCO$_2$e)**

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**Proposals (emissions abatement ktCO$_2$e)**

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Annex B: Emissions targets and projections for policies and proposals (ktCO₂e)

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<td>+702</td>
<td>+572</td>
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