

Stewart Stevenson
Minister for Environment and Climate Change
St Andrew's House
Regent Road
Edinburgh EH1 3DG

1 July 2011

Dear Stewart

**Committee on Climate Change: Advice to the Scottish Government on
emission targets for 2023-2027 and credit use in 2013-2017**

This letter is in response to a letter from Roseanna Cunningham in March 2011 requesting advice on Scottish emission targets for 2023-2027, and the use of credits to meet targets in 2013-17.

We recommend that Scottish targets should be based on a 3% emissions reduction in 2023, 3.7% in 2024, 4.7% in 2025, 4.9% in 2026 and 5.1% in 2027. These would put Scotland on a path to an emissions reduction of around 60% in 2030 relative to 1990 levels.

We recommend that the aim should be to meet these targets through domestic emission reductions rather than the purchase of credits. This reflects opportunities for deep cuts to residential, non-residential, transport, and power sector emissions in Scotland, together with the need to achieve longer term emissions targets through domestic abatement.

We note that new emission projections for agriculture and LULUCF will shortly be available. To the extent these differ from the projections in our analysis, the recommendations above should be adjusted accordingly.

We also highlight the need for a future revision to these targets to align with the level of any agreed EU cap for post-2020.

For the period 2013-17, we recommend that the use of credits should remain an option at levels allowed under the Scottish Climate Change Act.

This is because currently legislated emission targets will be very difficult to achieve unless the EU moves to a more ambitious 2020 emissions target. Given the high degree of uncertainty about what will happen in the EU, it is prudent to keep open the possibility of credit purchase at this stage.

A decision on the balance of domestic action versus credit purchase, or possible revision of targets will be required in 2012, in light of any developments in the EU over the next months.

We set out the analysis that underpins these recommendations in an attachment to this letter.

We would be happy to discuss the analysis and recommendations further if this would be useful.

Yours ever



Adair Turner
Chair, Committee on Climate Change

Attachment: Analysis underpinning recommendations on Scottish targets and the use of credits.

In developing our advice on Scottish emission targets for 2023-27, we have considered two approaches which are consistent with the methodology applied to the UK Fourth Carbon Budget.

- A top down approach, which is based on a minimum appropriate contribution from Scotland to required global emission reductions through the 2020s.
- A bottom-up approach, which is based on emission projections and an assessment of potential for emission reductions in Scotland in the 2020s.

We now consider each of these approaches. We then compare the approaches, and recommend which should be used to set Scottish emission targets. Finally, we consider the use of credits over the period 2013-17, given legislated targets and opportunities for Scottish emission reductions.

1. Top down approach

In this top down approach we assess an appropriate Scottish contribution to required global emission reductions through the 2020s to deliver the climate objective. The climate objective underpinning our analysis is to keep central estimates of global mean temperature change as close to 2 degrees as possible, and to keep probabilities of dangerous climate change above 4 degrees at very low levels (e.g. less than 1%).

Global emissions pathways consistent with this objective require early peaking of global emissions (e.g. by 2020) followed by deep cuts thereafter. The emissions trajectory from 2020 can be broadly characterised as equal annual percentage cuts.

An appropriate Scottish contribution to this trajectory might be equal annual percentage cuts towards the 2050 goal starting from the legislated 2022 target, with further cuts required depending on burden sharing in a global deal to cut emissions through the 2020s. This approach suggests annual average emissions cuts of 3.5% from 2023-27 (Table 1). This results in an emissions reduction of around 60% in 2030 relative to 1990 levels.

Table 1: Trajectory suggested by top down approach

	Legislated targets			Recommended targets based on top down approach				
	2020	2021	2022	2023	2024	2025	2026	2027
Target level of emissions ktCO ₂ e	40,717	39,495	38,310	36,961	35,659	34,404	33,192	32,023
<i>Reduction from previous year</i>	-3.0%	-3.0%	-3.0%	-3.5%	-3.5%	-3.5%	-3.5%	-3.5%
<i>Reduction from 1990</i>	-42%	-44%	-45%	-47%	-49%	-51%	-53%	-54%

2. Bottom-up approach

This approach is based on an assessment of abatement opportunities in Scotland (see Box 1), as well as emission reductions that are required on the path to the 2050 target, and are justified because they are cost-effective at the projected carbon price.

In setting out our emission scenario, we consider in turn: non-traded sector CO₂ emissions; non-CO₂ emissions; LULUCF emissions, aviation and shipping emissions, and traded sector emissions. We then draw together these scenarios into an economy-wide scenario for the 2020s.

Box 1: Emission scenarios

Business as usual

We use the term business as usual to refer to a reference emissions projection based on a scenario where no further policies are enacted beyond the policies included in the UK and Scottish Climate Change Programmes 2006. From this trajectory we then net the abatement potential in the Extended Ambition and Medium Scenario, as outlined below.

Extended Ambition

The Extended Ambition (EA) scenario was initially defined in the Committee's 2008 Report ("Building a low carbon economy") recommending the first three carbon budgets at the UK level¹. It reflects the abatement potential to 2020 from policies that are broadly committed to in principle (but where further definition and implementation is required).

It is characterised by widespread insulation of lofts and cavities, some insulation of solid walls, significant penetration of low carbon heat, deep cuts in emissions from transport and some lifestyle changes in homes and transport.

From the UK level analysis we estimate Scotland's abatement potential to 2020 and assume that the abatement achieved by 2020 continues at this level through to 2030.

Medium Abatement Scenario

The Medium Scenario was defined in the Committee's Fourth Budget Report². It describes a bottom-up assessment of abatement potential through the 2020s additional to Extended Ambition.

While 'low' and 'high' abatement scenarios were also defined, the Medium Scenario reflects abatement that is cost-effective at a projected carbon prices (the DECC central projection, which reaches £70/tCO₂e in 2030), technologically feasible, and necessary on the path to 2050.

It is characterised by significantly increased penetration of low carbon technologies throughout the economy, including power sector decarbonisation to around 50gCO₂/kWh, extensive roll out of low carbon heat and solid wall insulation, and electric vehicles accounting for around a third of the stock (60% new vehicle sales) by 2030.

Where we refer to 'Medium Scenario' in this analysis, this includes the abatement potential from the Extended Ambition (as assumed to continue through the 2020s), plus the additional abatement identified in Scotland for the 2020s.

¹ Committee on Climate Change (2008) '*Building a low carbon economy*'.
<http://www.theccc.org.uk/pdf/TSO-ClimateChange.pdf>

² Committee on Climate Change (2010) '*The Fourth Carbon Budget – reducing emissions through the 2020s*' http://downloads.theccc.org.uk.s3.amazonaws.com/4th%20Budget/CCC-4th-Budget-Book_plain_singles.pdf

CO₂ emissions scenarios in the non-traded sector

These comprise CO₂ emissions from heat in buildings and non-energy intensive industry, and transport.

Our scenarios for emissions in these sectors together result in a 42% reduction in non-traded sector CO₂ emissions by 2030 relative to 2008, due largely to energy efficiency improvement, renewable heat, and more carbon efficient cars and vans (See Figure 1 and Table 2)

Figure 1: Business as usual and Medium Scenario projections

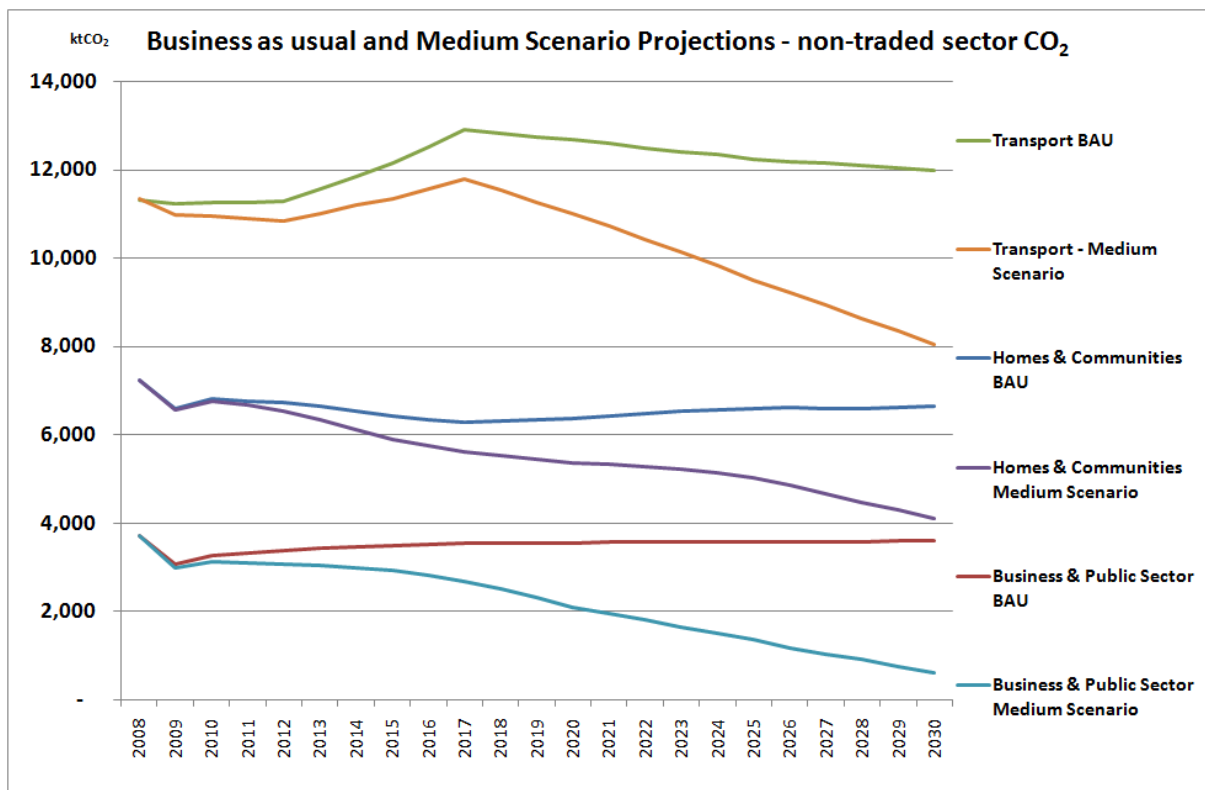


Table 2: 1990 emissions, business as usual emissions, abatement opportunities and 2030 Medium Scenario emissions in non-traded sector CO₂

	Homes & Communities	Business & Public Sector***	Transport
	MtCO ₂		
1990 emissions	7.5	N/A	10.8**
Business as usual emissions 2030	6.7	3.6	12
Measures Extended Ambition up to 2020 and medium take up of other measures thereafter to 2030. Figures in brackets represent abatement in MtCO ₂	<ul style="list-style-type: none"> Extended Ambition (-1) Additional low carbon heat in 2020s (-1.3) Solid Wall insulation in 2020s (-0.2) 	<ul style="list-style-type: none"> Extended Ambition (-1.5) Low carbon heat 2020s (-1.4) 	<ul style="list-style-type: none"> Electric and PHEV (-1.6) Hydrogen vehicles (buses only: -0.02) Conventional vehicle efficiency (-1.7) Biofuels (-0.6)
Total Abatement 2030	-2.5	-2.9	-4
Medium Scenario emissions 2030	4.1	0.7	8
Reduction from 1990	-45%	N/A	-26%
Reduction from 2008	-43%	81%	-29%
<p>* EU ETS did not exist in 1990 therefore we cannot split emissions for this sector between the traded and non-traded sector for 1990. **Transport emissions include: road, rail, non-traded domestic aviation and domestic shipping ***non-residential buildings and non-energy intensive industry</p>			

- **Residential buildings.** In our medium abatement scenario, emissions from residential buildings fall by 45% in 2030 relative to 1990. The main drivers here are insulation of all lofts and cavities where practical, widespread insulation of solid walls, and roll-out of low carbon heat.
- **Non-residential buildings.** Our Extended Ambition scenario assumes that most cost-effective emission reductions are achieved by 2020 through the Carbon Reduction Commitment and new measures for Small and Medium sized enterprises. Through the 2020s, the main source of additional abatement in the medium scenario is significant roll-out of low carbon heat technologies in this sector.
- **Non-energy intensive industry.** Here we also assume that the majority of cost-effective abatement options have already been taken up by 2020. For industry likely to be in the non-traded sector – i.e. non-energy intensive industries, electrification or use of biomass in low grade heat applications could replace carbon-intensive fuel use.
- **Transport.** A range of measures could reduce emissions from transport, including increased efficiency of conventional vehicles, increased penetration of electric and plug-in hybrid electric cars and vans, biofuels and hydrogen fuel cells (take-up is limited to buses in the Medium Scenario, at up to 50% of new buses by 2030).

Non-CO₂ emissions

Our approach for non-CO₂ emissions is to use the FAPRI model³ for agriculture reference projections, the Centre for Ecology and Hydrology (CEH) model for LULUCF projections (see section on LULUCF below) and the AEA model⁴ for reference projections in other sectors. We then net from these baseline projections our assessment of abatement potential.

Our analysis suggests that there is scope to reduce emissions by around 2.5 MtCO_{2e} by 2030.

³ <http://archive.defra.gov.uk/evidence/economics/foodfarm/reports/fapri/index.htm>. We use this model for agriculture emissions as it incorporates more up to date information on historic livestock trends, which impacts on projections.

⁴ Though non-CO₂ emission projections for the UK as a whole are now produced by DECC, the most recent projection for devolved administrations remains that published by AEA in 2009, based on the 2007 inventory. The report accompanying these projections is available from: [http://uk-air.defra.gov.uk/reports/cat07/0912111421_DA_non-CO₂ Projections_2007_to_2025_Report_v1r.pdf](http://uk-air.defra.gov.uk/reports/cat07/0912111421_DA_non-CO2_Projections_2007_to_2025_Report_v1r.pdf)

- **Agriculture.** Through a range of soil and livestock measures, there is scope to reduce agriculture emission by up to 1.4 MtCO₂e by 2030.
- **Other non-CO₂ emissions.** The main other source of reductions in non-CO₂ in Scotland is from the Zero Waste Strategy – we assume that the abatement achieved by 2022 (0.7 MtCO₂e continues to 2030). We also apportion Scotland a share of the additional UK abatement that could be achieved by 2030 (0.3 MtCO₂e)

LULUCF

Our scenario reflects the business as usual projection based on the 2009 inventory, which covers the period to 2020. Beyond this, our scenario reflects a continuation of the long term trend⁵. In this scenario, emissions for LULUCF as a whole are -5.3 MtCO₂e in 2030, compared to -5.7 MtCO₂e today.

The sequestration achieved through the Scottish Government's policy to increase planting rates to 10,000 hectares per year (0.4 MtCO₂e by 2022) is assumed constant through to 2030, resulting in emissions of -5.7 MtCO₂e by 2030.

Aviation and shipping

For aviation emissions, we use the methodology recommended in our February 2010 report to the Scottish Government (i.e. sharing UK bunker fuels on the basis of activity). We combine this with an assumption that the EU ETS limits aviation emissions in the 2020s to no more than 0.6 MtCO₂ for domestic aviation and 1.0 MtCO₂ for international aviation.

For shipping emissions, we assume that these are flat through the 2020s. This is consistent with our analysis of UK shipping emissions as set out in our report on the fourth carbon budget. We are currently carrying out an in depth review of shipping emissions, which we will publish in Autumn 2011.

Traded sector emissions

Traded sector emissions for the 2020s comprise those from power generation and energy intensive industry, and will be defined by the EU ETS cap. However, there is currently no meaningful cap for the 2020s (the default path through the 2020s in the EU ETS Directive is incompatible with the 2050 target).

⁵ It is likely that updated projections from CEH will subsequently become available which will extend this projection to 2030. The proposed targets should be adjusted to reflect these projections once available.

Therefore our approach is to develop a scenario for traded sector emissions based on abatement opportunities in Scotland, which could subsequently be aligned with the EU ETS cap when this is set.

In the power sector, we note that Scotland aims to have renewable generation equal to gross electricity consumption by 2020, together with additional generation from fossil fuel plant (i.e. net supply would be exported to the UK market).

Given declining scope for fossil fuel generation in light of carbon prices and stretching emission targets, our scenario assumes that generation from unabated fossil fuel plant is limited in the 2020s.

Specifically, we assume that Scotland goes at least as far as the UK in decarbonising its power sector, and therefore that it achieves average emissions no more than 50 gCO₂ / kWh, compared to average emissions today of around 340gCO₂ / kWh.

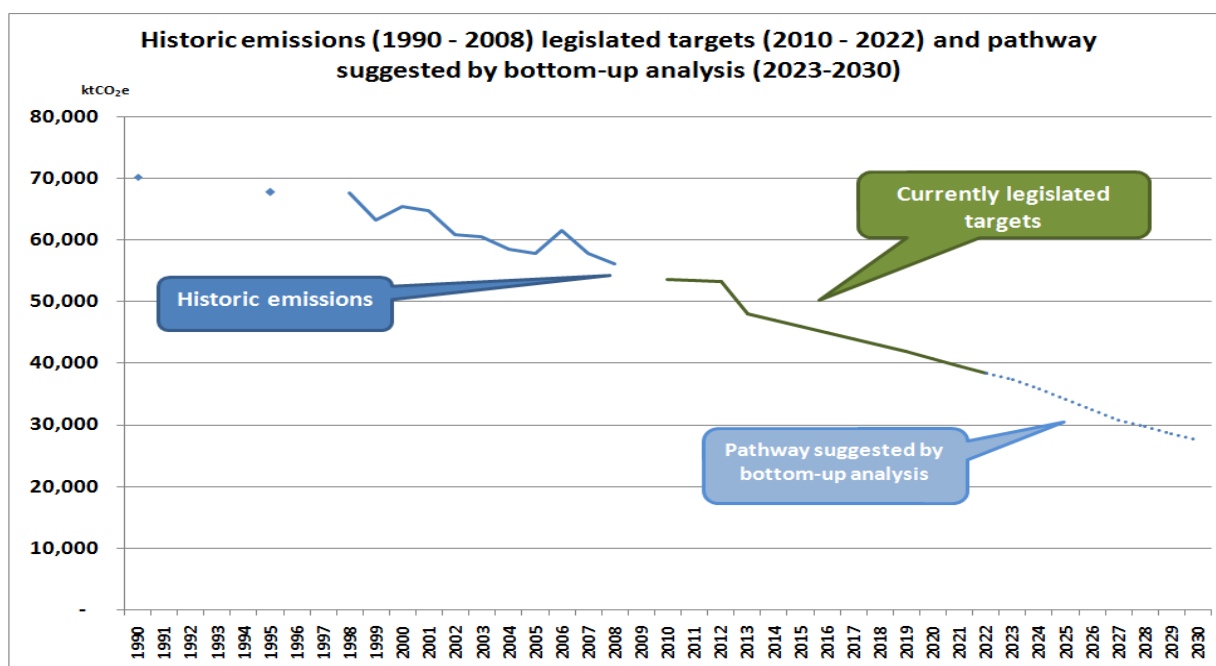
This figure should apply to all electricity produced in Scotland, given that emissions under the Scottish Climate Change Act are accounted on a production rather than a consumption basis.

In the energy intensive sectors, analysis suggests that there is abatement potential of up to 0.3 MtCO₂e, with particular opportunities in the cement sector. Additionally, emissions from refineries in Scotland could be reduced by 0.4 MtCO₂. Together with use low carbon technologies for space heating and biogas and biomass for higher grade heat applications, emissions could be reduced by around 2.1 MtCO₂ across energy intensive industry by 2030.

Economy-wide emissions scenarios

Aggregating across the scenarios above gives an economy wide emissions trajectory, on which there is an emissions cut of around 50% in 2025 relative to 1990 levels, and around 60% in 2030 (Figure 2).

Figure 2: Historic emissions, legislated targets and bottom-up pathway



The annual emissions cuts on this path are shown in Table 3.

Table 3: Emission targets suggested by bottom-up approach

	Legislated targets			Recommended targets				
	2020	2021	2022	2023	2024	2025	2026	2027
Target level of emissions ktCO ₂ e ⁶	40,717	39,495	38,310	37,378	35,787	34,117	32,446	30,777
Reduction from previous year	-3.0%	-3.0%	-3.0%	-2.4%	-4.3%	-4.7%	-4.9%	-5.1%
Smoothed Pathway consistent with Climate Change (Scotland) Act	40,717	39,495	38,310	37,161	35,787	34,117	32,446	30,777
Reduction from previous year	-3.0%	-3.0%	-3.0%	-3.0%	-3.7%	-4.7%	-4.9%	-5.1%
Reduction from 1990	-42%	-44%	-45%	-47%	-49%	-51%	-54%	-56%

⁶ Based on the Scottish Government’s legislated 42% reduction in 2020 relative to 1990 and the requirement in the Scottish Climate Change Act that target levels each year thereafter must reflect at least a 3% reduction from the previous year.

The relatively low annual reduction between 2022 and 2023 reflects the ambitious target already legislated for 2022. Noting that this reduction is inconsistent with the Scottish Climate Change Act, smoothing of the path in the bottom-up scenario gives annual reductions of 3% in 2023, just under 4% in 2024, and 5% from 2025-27. Achieving this would require bringing forward some of the abatement in 2024 in our Medium Abatement scenario.

3. Recommended targets

Our top down and bottom up approaches give a similar emissions reduction in 2030 (i.e. around 60% on 1990 levels).

In the top down approach the pace of emissions reductions is initially higher than in the bottom up approach.

However, the top down approach is highly uncertain, reflecting the high degree of uncertainty around a future deal.

It goes beyond what we have identified as cost-effective abatement potential in Scotland for these years.

We therefore recommend that targets should reflect the bottom up approach (i.e. building in cost-effective abatement potential), with adjustment of the targets if a future EU and / or global deal requires deeper cuts.

We note the need for possible adjustment as new emissions projections for agriculture and LULUCF are published this summer: to the extent that these do not reflect our assumptions, and it impacts on available abatement potential, then the targets should be amended to reflect this.

Beyond that, these targets could also be adjusted to reflect the EU ETS cap for the 2020s when this is agreed, and the precise nature of a global deal.

Following a path of equal annual percentage reductions after the 2027 target to 2050, combined with legislated targets from 2010 – 2022, gives total emissions under the bottom up approach are around 1,250 MtCO₂e from 2010 to 2050. This is around the level of the maximum cumulative emissions budget which we recommended to the Scottish Government in January 2011.

4. Costs and wider considerations

We estimate that costs associated with targets based on our bottom up methodology would commit Scotland to a cost of around 1% of GDP in 2030.

Consideration of wider economic and social factors suggests that any potential adverse impacts could be managed:

- **Fiscal.** The main fiscal consequences of decarbonisation in the 2020s at the UK level relate to reduced fuel duty. However, given that this is a reserved matter, it is not relevant in the case of Scottish targets.
- **Competitiveness.** It is important that the carbon constraint for energy-intensive industries in Scotland is not too tight relative to those in other countries. There is limited risk of this under the targets that we have proposed, given that include abatement measures that are cost-effective at a relatively low carbon price.
- **Fuel poverty.** Rising carbon prices and support for investment in renewable energy could result in higher energy bills. This could exacerbate fuel poverty, which is already a significant problem in Scotland. One key measure to address this is energy efficiency improvement, where there is an important role for the Scottish Government in supporting implementation the Green Deal and the Energy Company Obligation and reinforcing existing fuel poverty programmes
- **Security of supply.** Although concerns have been raised around intermittency of power generation, our Renewable Energy Review⁷ suggests that this can be managed through a range of options (i.e. demand side flexibility, storage, interconnection, and balancing generation). Increasing the proportion of renewable generation could enhance security of supply by reducing reliance on imported fossil fuels for power and heat generation.

5. Use of credits from 2013-17

Emission targets for Scotland require a 10% emission reduction in 2013 and 2% annual reductions each year over 2014-17.

Our analysis suggests that these would be achievable if the EU increases its ambition and agrees a target to reduce emissions by 30% in 2020 relative to 1990

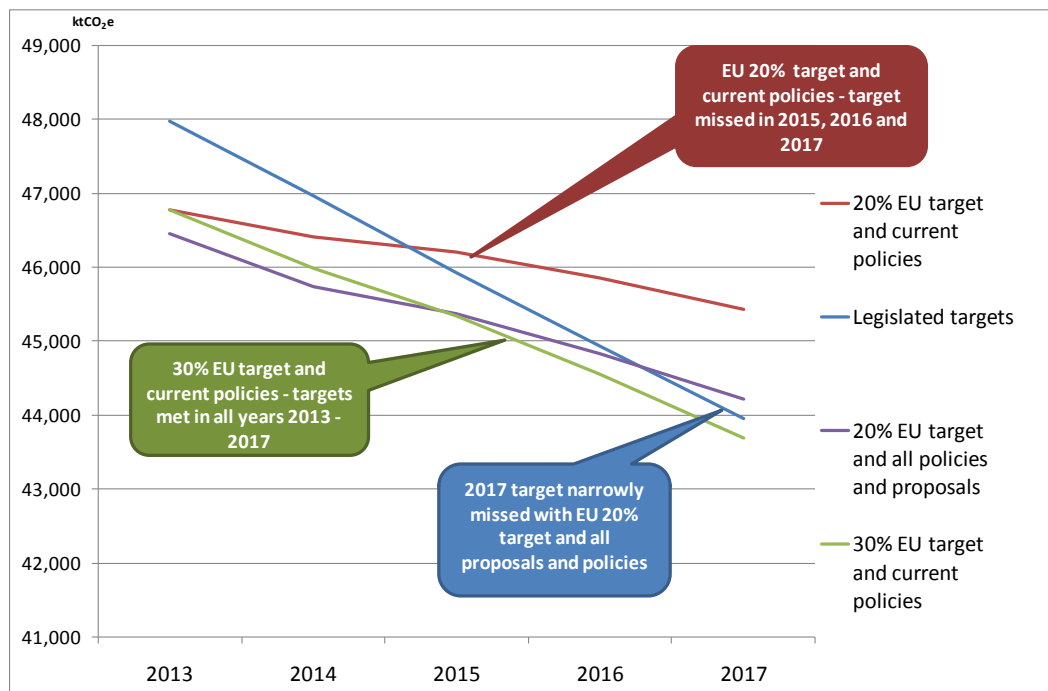
⁷ Committee on Climate Change (2011) *Renewable Energy Review*:
<http://www.theccc.org.uk/reports/renewable-energy-review>

levels. This would result in a tightening of the EU ETS cap, which would reduce Scotland's net emissions.

However, there is a great deal of uncertainty over whether and when the EU will increase its ambition. If this were not to happen, then meeting targets would be very challenging on the basis of domestic abatement alone.

For example, Figure 3 shows our emissions projection under the current EU ETS cap versus the Scottish targets. It highlights that in the absence of increased EU ambition, there would be a gap between currently legislated targets and projected emissions. This would be the case even if all the additional abatement identified in the Scottish Government's Report on Proposals and Policies⁸ could be delivered.

Figure 3: Emission trajectories under varying assumptions about the EU cap and Scotland's abatement policies versus legislated targets



Given this uncertainty on the EU target for 2020 we recommend that the option to purchase credits should be kept open at this stage, and to the limit allowed under the Scottish Climate Change Act. If there were to be a delay in agreeing a more ambitious EU target, then the Scottish Government would have to either identify additional abatement opportunities, purchase credits to meet targets, or change targets.

⁸ <http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/lowcarbon/rpp>