

WRITTEN SUBMISSION FROM ROYAL SOCIETY OF CHEMISTRY

The RSC welcomes the opportunity to submit formal written evidence to the consultation on the Climate Change (Scotland) Bill.

The RSC is the UK Professional Body for chemical scientists and an international Learned Society for advancing the chemical sciences. Supported by a network of over 46,000 members worldwide and an internationally acclaimed publishing business, our activities span education and training, conferences and science policy, and the promotion of the chemical sciences to the public.

The document has been written from the perspective of the Royal Society of Chemistry. The RSC's Royal Charter obliges it to serve the public interest by acting in an independent advisory capacity, and we would therefore be very happy for this submission to be put into the public domain.

Q1 The Bill creates a statutory framework for greenhouse gas emissions reductions in Scotland by setting a 50% reduction target for 2030 and an 80% reduction target for 2050.

What are your views on the 2050 target and a 2030 interim target proposed in the Bill?

The RSC believes that the Scottish Government is right to set a long-term legal target for reducing greenhouse gas (GHG) emissions through domestic and international action by at least 80% by 2050.

The RSC believes that the target to reduce GHG emissions by 80% below 1990 baseline levels by 2050 can be achieved but requires immediate action towards the following key goals:

- A strong and joined-up national and international leadership and policy that aims to massively reduce GHG emissions;
- A public consensus to save energy through both lifestyle changes and minimising heat loss from buildings;
- Energy efficient products and processes that minimise energy use in both manufacture and product use;
- Decarbonised transport achieved by developing highly efficient biofuels, lightweight construction materials, hybrid and electric vehicles, battery technology and further research into the potential of hydrogen as a fuel. Additionally there is a need to maximise the efficiency of conventional vehicles and fuels;
- Electricity produced from renewable energy sources such as wind, wave, solar and biomass resources
- Development of carbon capture and storage technology so that the vast coal reserves of the Earth that will be exploited are done so with minimal GHG emissions; and
- Investment in skilled people and research and development so that future sustainable energy technologies will be developed.

However, it is important to recognise that reducing global emissions of GHGs by 80% by 2050 still commits the Earth to significant global warming for hundreds of years. This highlights the importance of an adaptation strategy alongside measures to reduce emissions.

The RSC believes that the Scottish Government should retain the ability to adjust the 2050 target in light of scientific advice, particularly that from the Committee on Climate Change. The science of climate change is evolving rapidly and it is vital that flexibility remains to account for the latest developments. For example, if an authoritative body, such as the Committee on Climate Change, concludes that there is a need for the GHG emission reduction target of 80% to be amended then this should be possible within this proposed system.

The RSC believes that setting of an interim target of 50% is sensible. The RSC also believes that an earlier interim target for the year 2020 would be appropriate so that Scotland's reductions are in line with the UK, which has an interim 26% reduction target by 2020. However the RSC believes that the Committee on Climate Change should be free to advise Scottish Government on a pathway that will achieve the 2050 target without constraint; if the Committee on Climate Change were to believe that the optimal pathway would be one that delivered a reduction in GHG emissions greater than 50% by 2030 then this should not be hindered.

Scotland accounts for around 0.2% of global GHG emissions; therefore if Scotland's emission

reductions are not matched by concerted global efforts then the Scottish economy will suffer and the world will continue to warm. To this end the RSC applauds the intention of Scotland to continue the argument for a global effort on climate change.

Q2 The Bill requires that the Scottish Government sets annual targets, in secondary legislation, for Scottish emissions from 2010 to 2050. It is proposed that these annual targets will be set in batches, the first being for the years 2010 to 2022 inclusive.

What are your views on the setting of targets in batches from 2010 to 2022?

The RSC believes the rationale behind setting targets in batches is sensible; however the Scottish Government must be careful that setting the targets in batches does not hinder Scotland from reducing its emissions more quickly.

Q3 The Bill provides that from the year 2020, the annual emissions targets must be set so that each is at least 3% lower than the target for the previous year. Prior to 2020, the Scottish Government has indicated that it intends to set annual targets which build towards delivering emissions reductions of at least 3% each year.

What are your views on this approach or any possible alternative approaches?

The RSC believes this is sensible. However, it is important that the Scottish Government listens to advice from the Committee on Climate Change and that the annual targets, both before and after 2020, build towards delivering the 2050 80% reduction target. The RSC therefore recommends that the annual targets should be at least 3% lower than the preceding year from the point that the Bill is enacted. This would result in a steeper decrease in emissions and over the 40 year period result in lower total emissions; the Bill must not be a limiting factor in tackling climate change.

Q.4 The Bill introduces the concept of a “net Scottish emissions account” as a point of reference against which the target for reducing greenhouse gases can be measured. It is defined as the net Scottish emissions plus or minus any carbon units credited to or debited from the account. Any units purchased may be used to offset Scottish emissions. Any carbon units generated in Scotland and sold to customers outside Scotland, count as emissions made in Scotland.

What are your views on the proposals in the Bill relating to the net Scottish emissions account, and should there be a limit on the number of carbon units which Scotland can purchase?

The RSC believes that the concept a “net Scottish emissions account” is well conceived. However, the facility to purchase carbon units from outside Scotland to meet domestic targets, in terms of their overall quantity and sources should be used as a last resort. If carbon units are required to be purchased then the Scottish Government should be asked to explain why domestic measures failed to deliver the required GHG emission reduction. The RSC is also concerned about how the performance of international schemes will be monitored and policed to ensure they are delivering the expected GHG reductions. The RSC believes that it is critically important that monitoring and early warning systems are in place to ensure achievement of targets is on track. The Committee on Climate Change has a vital role to play here. It is important that during the Committee’s annual review of progress towards targets that where progress is unsatisfactory that the Scottish Government is obliged to put in place measures that will rectify the situation.

Q5 The Bill defines “Scottish emissions”, in relation to a greenhouse gas, as being emissions of that gas which are attributable to Scotland. The policy memorandum states that “Scottish emissions” are defined as being those greenhouse gases which are emitted in Scotland or which represent the Scottish share of emissions of gases from international aviation and international shipping.

What are your views on this definition of Scottish emissions?

The RSC believes that on the whole the definition of “Scottish emissions” is sensible; it is essential that a share of emissions from international aviation and shipping are included. However, the RSC believes that whether carbon intensive products which are imported into Scotland should be included into the definition of “Scottish emissions” is an issue that needs further debate.

Q6 The Scottish Government has indicated that initially it intends to seek independent, expert advice on climate change from the UK Committee on Climate Change. The Scottish Government states in the policy memorandum that if it determines that the UK Committee on Climate Change does not meet all the advice needed for Scotland, the Bill contains provisions which will allow the Scottish Government to establish a Scottish Committee on Climate Change or to designate an existing body to exercise these advisory functions.

What are your views on the Scottish Government's approach to obtaining independent, expert advice on climate change?

The RSC believes that any advice received by the Scottish Government needs to be truly independent and based on quality scientific fact; the need for an independent advisory Committee is essential if the objectives of the Climate Change (Scotland) Bill are to be met.

The UK Committee on Climate Change is an appropriate independent body to inform the Scottish Government on a pathway towards the 2050 target and to monitor progress *en route*. However, since some circumstances may differ between the UK and Scotland, the RSC believes it is sensible to allow provision for a Scottish Committee on Climate Change.

If the Scottish Government does decide to appoint a separate Scottish Climate Change Committee then it is important that careful consideration is given to the make up of the committee. RSC believes the committee should be made up of not only identified expert positions but also associated shadow advisory groups of: technology development, energy production, climate science and adaptation to climate change. It is necessary for the individual experts in each of these fields to be supported by advisory groups since individual experts cannot cover the vast range of developments that each of these fields represents. Of foremost concern is the possibility that the chosen expert may be biased towards a particular viewpoint or technology. This could have massive and detrimental knock on effects if biased and ill-advised decisions were taken. As an extreme example, on the advice of a Committee member the Scottish Government takes a decision to invest in a particular technology, at the detriment of other technologies, that ultimately proves not to deliver GHG emission reductions promised and Scotland fails to achieve its statutory GHG emission reduction target.

Q7 The Bill places duties on the Scottish Government requiring that it reports regularly to the Scottish Parliament on Scotland's emissions and on the progress being made towards the emissions reduction targets set in the Bill. The Bill sets out details of these reporting requirements.

What are your views on these proposed reporting arrangements?

The RSC agrees that the Committee on Climate Change should report to the Scottish Parliament annually on Scotland's progress towards both its budgets and targets. It is vital that progress is subjected to scrutiny and that where necessary the Scottish Government must justify its performance and indicate remedial actions.

The RSC also agrees that the report should state whether or not the budget was met. In this statement the RSC recommends that the data be presented transparently so that it is obvious what progress has been made and through which mechanisms carbon emissions have been reduced and also where mechanisms have failed. The RSC also agrees that should the annual target not be met, Scottish Ministers should lay before Parliament a report setting out proposals and policies to compensate in future years for the excess emissions.

Q8 The Bill contains powers to allow the Scottish Government, by regulations, to impose duties on public bodies in relation to climate change, to issue guidance to those bodies relating to their climate change duties and to require that they report upon the discharge of those duties.

What are your views on this proposal?

No comment.

Q9 The Bill places a duty on the Scottish Government to produce a report for Scotland, setting out its objectives in relation to adaptation to climate change, proposals and policies for meeting them and the timescales within which they will be introduced.

What are your views on this proposal?

The RSC is aware that the natural environment will change because of climate change and therefore it is essential that we have the correct tools to monitor this and base any intervention measures on sound scientific evidence.

Carbon dioxide persists in the atmosphere for around 100 years, so even if levels of CO₂ emitted are dramatically reduced in the coming decades, atmospheric concentrations of CO₂ will take a long time to respond. This means that the GHGs already emitted since preindustrialised times have committed us to global warming for at least the next century, and the possibility of stabilising temperatures will take decades longer and then only if action is taken now. Therefore the effects of climate change over the period from the present day to 2100 or longer should be considered, as any adaptation and mitigation of climate change will need to occur over at least this time frame.

Q10 Muirburn is the act of controlled burning of vegetation on open semi-natural habitats such as muir (Scottish word for moor) or moorland, and includes the burning of plants such as gorse, heather and grass. The Bill contains an enabling power to allow the Scottish Government to vary the permitted times during which muirburn may be made where they consider it necessary or expedient to do so in relation to climate change.

What are your views on this proposal?

Burning vegetation should be avoided wherever possible; if possible it should be collected and used as a feedstock for biomass-based products or fuels.

Most biomass for energy production is currently derived from industries such as forestry and from wood processing waste. Instead of burning vegetation it could be used to produce electricity, heat, biofuels or as a feedstock for the chemical industry in dedicated facilities. The potential for increased exploitation of biomass resources is very large.

Q11 The Bill will allow modification by order of the functions of the Forestry Commissioners to enable the Forestry Commission in Scotland to play a greater role in tackling climate change. The immediate intent of the Scottish Government is to take forward proposals relating to renewable energy development on the National Forest Estate and the release of capital from the National Forest Estate for woodland creation.

What are your views on this proposal?

The RSC believes that although growing more trees will remove CO₂ from the air, the benefits of this will be negated if the wood is exported and burnt elsewhere. It is Scotland's responsibility to ensure that full life-cycle analysis applied to the new woodland.

The RSC believes that any proposals that support the use of new renewable energy should be supported. In spite of the apparent high land requirement for the production of significant quantities of biofuel using current technology, it is estimated that the total solid biomass potential is about 25% of total projected energy demand in 2050. Additionally local energy generation and use should help to reduce GHG emissions. However, if the intention of the Scottish Government is to use biomass, life-cycle analysis should be used to make sure it is truly carbon neutral.

Full life-cycle analysis should assess the implications of energy generation, including extraction, construction, transformation, transmission, usage and end-of-life. Only through a comprehensive and transparent process will the environmental impact be known and only then can energy options be compared on an equal basis. This will only be achieved with an intimate knowledge of the chemistry and thermodynamics of energy generation. This process will identify major opportunities for new chemistry such as methodology for highly efficient and low energy *in situ* extraction. The major challenge here is to develop life cycle assessment methodology that is globally accepted, robust and transparent.

Q12 The Bill requires the Scottish Government to produce an action plan setting out current and proposed measures to improve the energy efficiency of buildings in Scotland, as well as measures to encourage behavioural change.

What are your views on this proposal?

The efficient use of energy in buildings is a fundamental sustainability issue; more than 40% of Scotland's CO₂ emissions, a major cause of climate change, come from the energy used to heat, light and run its buildings. It is essential that this is tackled through energy efficient measures and behavioural change.

The RSC is a partner in the European platform for sustainable chemistry (SusChem); one of the initiatives of this project is the **smart energy home**¹ (see Figure 1), which is a good model of an energy efficient building. In this project ground-breaking technologies and smart materials will make this vision possible by reducing heat loss, improving energy efficiency and absorbing and transforming energy into electricity. This project aims to demonstrate a mixture of present and future energy technologies and has an interactive control system that provides real-time information on the status of the property. By a combination of smart windows and insulation materials, micro-energy generating technologies and intelligent control systems this project will demonstrate that a house can actually generate electricity for sale to the national grid.

It is also important to stress that this technology can be retrofitted to the existing housing stock and that energy efficiency measures should not just apply to new build. The RSC believes that the Scottish Government should set out its own action plan for ensuring energy efficiency in existing housing especially since much of Scotland's housing stock is under council control.

¹ www.suschem.org

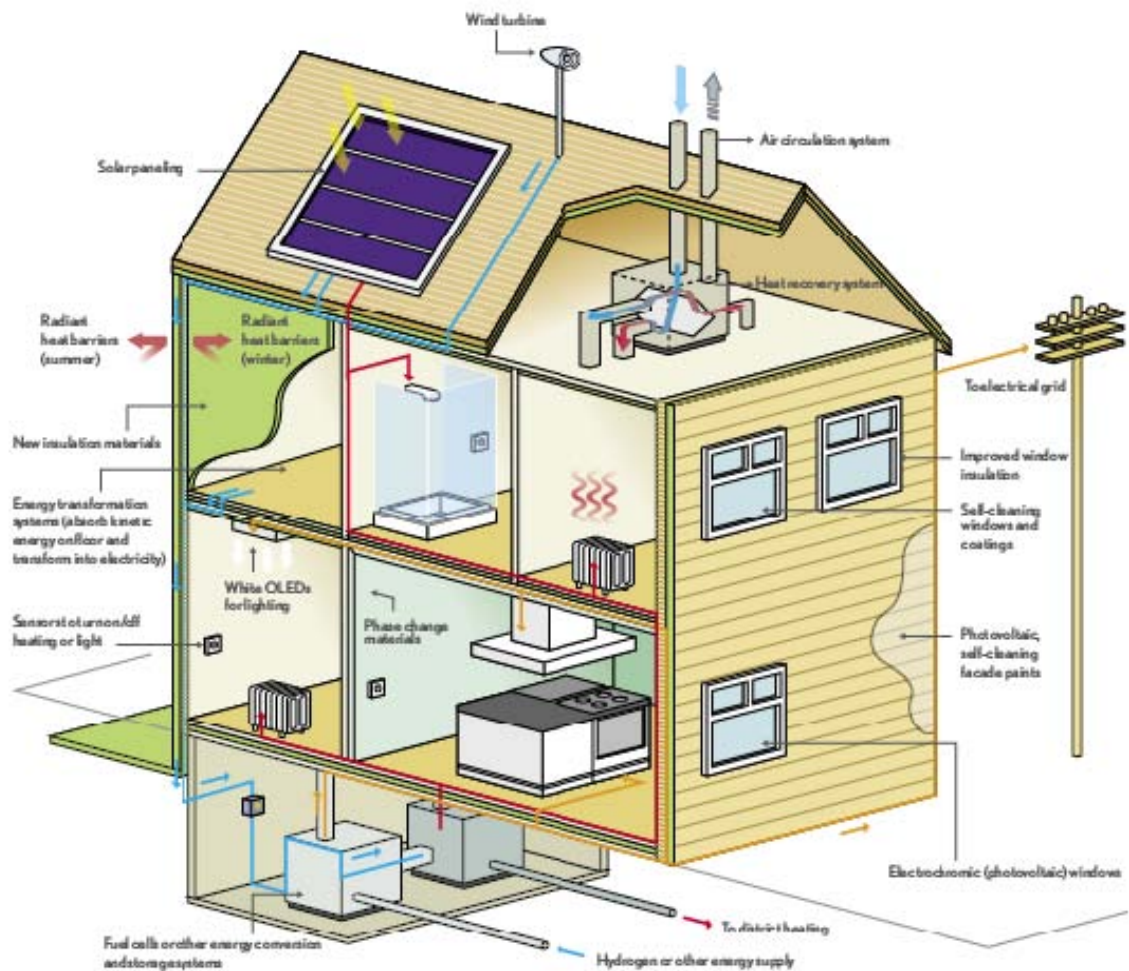


Figure 1: SusChem smart energy home

Q13 The Bill confers powers on the Scottish Ministers to make regulations providing for the assessment of (a) the energy performance of non-domestic buildings; and (b) emissions of greenhouse gases produced or associated with such buildings. The provisions are enabling in nature and the Policy Memorandum provides further information on the Scottish Government's thinking in this area.

What are your views on this approach?

It is important that the energy performance of non-domestic buildings and the GHG emissions from these buildings is assessed. However, since it is estimated that the domestic sector in Scotland accounts for approximately 30% of CO₂ emissions; the RSC believes that in addition the Bill should confer powers on the Scottish Ministers to make regulations providing for the assessment of the energy performance of domestic buildings, coupled to a grant scheme to encourage people to improve the energy efficiency of their homes. The domestic sector offers a huge opportunity and a challenge for reducing GHG emissions and domestic energy efficiency measures can play a significant part in meeting Scotland's GHG reduction targets. 40% of domestic energy consumption is used to heat homes, and in turn, 30% of this energy is lost through windows. Smart coatings on glass and highly efficient insulation materials could dramatically reduce heat loss in all buildings saving money and reduce GHG emissions. With sufficient support, scientists and engineers will continue to develop products and services that are energy efficient.

Q14 The Bill places a duty on the Scottish Government to take such steps as it consider appropriate to promote the use of heat from renewable sources. The Scottish Government has indicated this provision will enable it to introduce measures it deems appropriate to incentivise the production of heat from renewable sources.

What are your views on this proposal?

The RSC believes the promotion of the use of heat from renewable sources is good and agrees it will help to meet the EU 2020 target of 20% final energy consumption from renewable sources. However since this target is made up of individual targets for electricity, heat and transport, the RSC does not understand why the Bill limits the incentives to the production of heat. Scotland is well placed to generate both heat and electricity from renewable sources due to the excellent wind and coastal resources and hydro already generates approximately 10% of Scotland's current total energy generation

The RSC believes that the Scottish government should continue to support hydro projects to ensure that hydro will continue to play its part in Scotland's renewable energy generation of both heat and electricity.

The use of wind energy has grown rapidly over the past decade, with current capacity providing nearly 0.5% of the world's electricity supply. Most forecasts show the capacity of wind energy continuing to grow. Scotland can and should be a part of this since its location means it has an excellent wind resource and Scotland possesses potential for offshore wind development. Developing and providing coatings for the protection of wind turbines is already a strongly competitive and growing business and the Scottish Government should encourage and support Scottish material scientists in this area. The RSC approves that the Scottish Government is already helping to fund the development of a demonstrator project of an offshore wind development in deep water in the Moray Firth.

Scotland possesses a huge wave and tidal energy resource; the potential exists to generate far more electricity than currently needed, from wave and tidal energy sources in the waters around the Scottish coast. There are several devices currently on test around the world ranging from tidal current turbines to large pistons that cause rising waves to force a column of air through a turbine. Scotland is surrounded by the North Sea and Atlantic Ocean; it is in a prime location to make use of these technologies to generate electricity. The RSC approves of the funding given to the construction of the European Marine Energy Centre from the Scottish Government.

In order to reduce GHG emissions from transport it will be necessary to use electric cars which run on electricity generated from renewable sources. In order for this to become a reality the RSC believes that the Scottish Government must also invest in scientific research into viable means of energy storage such as batteries, supercapacitors *etc.*

**Q15 The Bill sets out measures aimed at improving waste and recycling. The Bill gives powers to the Scottish Government to make regulations in the following areas:
Waste prevention and management plans;**

**Waste data;
Deposit of recyclable waste;
Procurement of recyclate;
Reduction of packaging;
Deposit and return schemes;
Charges for carrier bags.**

What are your views on these proposals?

The RSC supports any moves to become a more sustainable society. Recycling should take place wherever possible. The RSC believes the Scottish Government should make regulations in all these areas now.

The RSC is concerned that the policy memorandum indicates that the Scottish Government will initially rely on voluntary action to achieve the goal of improving waste and recycling and only intends to introduce legislative action, sanctioned by the Bill, if voluntary action does not achieve these goals.

The RSC suggests that timescales for the impact of global warming are perceived as too far in the future and that people cannot associate today's individual actions with their impact on future climate change scenarios. This is a huge challenge to overcome as action is required now in order to reduce the impact of climate change.

To encourage individuals to “do their bit” towards minimising the impact of climate change will require a framework of incentives, regulation, education and demonstration and all of these must be at an appropriate level to inspire action.

The RSC recognises that regulation forcing the public towards a change in lifestyle is unlikely to be a vote winner. The RSC suggests that such legislation and regulation be brought in on the back of a cross-party agreement that demonstrates consensus of all major parties to the measures in the long-term. Equally such measures should be backed with an incentive, education and demonstration scheme at the appropriate level that clearly demonstrates the benefits and assistance of the measures.

In the public sector the Scottish Government must show leadership and demonstrate significant carbon emission reduction in both its buildings and its vehicle fleet. Such a scheme would increase stakeholder confidence in carbon emission measures and provide valuable data on high impact programmes and technologies.

Q16 What are your views on the adequacy of the Scottish Government’s consultation in advance of publishing the Bill?

No comment

Q17 Do you have any views on the Strategic Environmental Assessment which was carried out by the Scottish Government out on the consultation proposals?

No comment.

Q18 Does the Bill raise any equalities issues you would wish to highlight?

No comment.

Q19 Do you have any comments on the impact of the Bill on sustainable development?

It is important that there are sufficient trained and committed scientists and engineers to carry out the research, development, demonstration and deployment of renewable energy-generating technologies. It is also important that the Research Councils and DIUS ensure that there are collaborative funding mechanisms throughout the technology development pathway that allow scientists, engineers and technologists to work together to bring basic research through to developed products.

Q20 Do you have any other comments on the Bill?

No comment.