

The case for a net zero climate change target

by Suzanna Hinson, Andy Kerr, and Stephen Tindale

“We commit to doing our part to achieve a low-carbon global economy in the long-term including developing and deploying innovative technologies striving for a transformation of the energy sectors by 2050.”

*-Think Ahead. Act Together.
Leaders’ Declaration at the G7 Summit, 7–8 June 2015*



Contents

About this report	3
Introduction	4
In a Nutshell.....	4
Current climate science	5
Keeping warming well below two degrees	6
The economic benefits of a move to clean energy	7
The 2008 Climate Change Act and the Committee on Climate Change	9
Leading by Example	10
Why should the Climate Change Act target be strengthened?.....	11
Conclusion.....	13

About this report

Stephen Tindale (@STindale) is a climate and energy consultant who has worked on these issues since 1989. He is the co-founder of Climate Answers (www.climateanswers.info). His previous roles include: Research Fellow at the Centre for European Reform; Head of Communications and Public Affairs at RWE npower renewables; Executive Director of Greenpeace UK and chair of the Greenpeace European Unit; Adviser to UK Environment Minister Michael Meacher.

Andy Kerr is Director of the Edinburgh Centre for Carbon Innovation (ECCI) and co-Director of the Scottish Centre of Expertise on Climate Change (ClimateXChange). He is a non-executive member of the Scottish Government's "Climate Change Delivery Board", which has responsibility for overseeing delivery of Scotland's stretching emission reduction targets, and a Board member of the National Centre for Resilience.

Previously, Andy worked in the private sector, trading energy and carbon in Europe and Asia and developing renewable energy projects internationally and working with corporations to develop both strategic and practical management responses to emerging environmental legislation.

Suzanna Hinson is a researcher and writer for Climate Answers. Suzanna studied Geography at Cambridge University before beginning work with Stephen in 2015. Her previous experience is focused on renewable energy development in the UK. She is now studying for a MSc in Climate Change and researching both the nuclear industry and the EU renewable market.

This report was commissioned by [Sandbag](http://sandbag.org.uk), with the support of the European Climate Foundation, and edited by Phil MacDonald, Damien Morris and Bryony Worthington. Contact info@sandbag.org.uk for more information.

This report was commissioned by Sandbag to explore why the UK, in the light of the Paris Agreement at COP21 in December, could consider an additional 'net zero emissions' long-term goal for the Climate Change Act 2008.

This report makes recommendations relevant for discussion in the Energy Bill [HL] 2015-16, as it enters the House of Commons.

Introduction

The international community adopted the Paris Agreement last month. One hundred and ninety-five countries, including the UK, agreed to reduce greenhouse gas emissions to help meet long-term temperature goals. The collective aim is to keep global temperature rise to well below 2 degrees Celsius and to drive efforts to limit the temperature increase to no more than 1.5 degrees Celsius.¹ The UK, the birthplace of the industrial revolution, has the opportunity to lead this global move towards a zero-carbon economy. This would deliver economic and health benefits to Britain, as well as strengthening international efforts to control climate change.

This report considers:

- Recent advances in the scientific evidence on climate change and the need to make greater emissions reduction in order to keep warming well below 2 degrees;
- The economic benefits of a move to clean energy;
- The role that the UK's 2008 Climate Change Act, with its long-term emissions reduction goal – 80% by 2050 – and interim carbon budgets, has had on other countries' approach to climate and energy policy;
- The potential economic benefits of increasing the target to 100%, and how this could be achieved, including the need for a 100% target to be net rather than gross because some UK greenhouse gas emissions are unavoidable.

In a Nutshell

We conclude that the Paris agreement now necessitates an increase in our long term climate target and that we should increase it to 100%, or in other words, set a “net zero” emissions target. Such a target would provide the UK with strong economic and social benefits whilst avoiding the economic and social risks of lagging behind others in the move towards a zero-carbon future.

The House of Commons should amend the 2015 Energy Bill to include a commitment to set a date by when the UK will achieve net zero greenhouse gas emissions. The Climate Change Committee (CCC) should then be asked to advise on what the date for the target should be, with that date then set in secondary legislation.

¹ UNFCCC COP21 Agreement, 13th December 2015
<http://unfccc.int/resource/docs/2015/cop21/eng/l09.pdf>

Current climate science

The scientific consensus is that climate is changing and that this is largely due to human activity. The Intergovernmental Panel on Climate Change (IPCC) published its Fifth Assessment Report in 2014. In the Summary for Policy Makers², the IPCC concludes that:

“Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen.”

The summary warns that:

“Climate change is projected to increase displacement of people. Populations that lack the resources for planned migration experience higher exposure to extreme weather events, particularly in developing countries with low income. Climate change can indirectly increase risks of violent conflicts by amplifying well-documented drivers of these conflicts such as poverty and economic shocks.”

Is human activity causing climate change? The IPCC states that emissions since the industrial revolution have:

“led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are extremely likely to have been the dominant cause of the observed warming since the mid-20th century.”

The balance of scientific evidence points very strongly to the need for climate action. Prime Minister David Cameron has sensibly described such action as an insurance policy.³

² IPCC, ‘Climate change 2014 Synthesis report for policy makers’, 2014.

³ Penny, T., ‘Cameron urges ‘Insurance Policy’ on climate change after Haiyan’, BloombergBusiness, November 16th 2013

Keeping warming well below two degrees

Because of green house gas emissions since the industrial revolution, 1°C of warming has already occurred and some further warming is now unavoidable. At the 2010 UN climate summit in Cancun, governments adopted a target to keep the global average temperature rise below 2°C, compared with pre-industrial levels. This has now been strengthened by the recent adoption of the Paris Agreement aiming for below 1.5°C.

Keeping warming to this level will require major emissions reductions in the coming decades. The IPCC 5th Assessment Report sets out possible global emissions pathways for keeping global mean temperatures “likely”, “more likely than not” or “more unlikely than likely” below 2°C above the pre-industrial levels. Scenarios that are likely to maintain warming below 2°C are characterized by 40-70% emission reductions globally by 2050 (compared to 2010), and emissions levels near or below zero (negative emissions, for example capturing and storing emissions from bioenergy) in 2100.

The IPCC “least cost” scenarios suggest that a *global* net zero target for carbon dioxide is required by between 2055 and 2070 in order to have a likely chance (denoted as >66% chance) of staying within a 2°C limit. And total global greenhouse gas emissions (including non-carbon dioxide gases) will need to go to net zero by 2080-2100.

In other words, net zero emissions targets or even negative targets in the second half of the 21st century are critical for any likelihood that global mean temperatures stay within 2°C from pre-industrial levels.

The G7 (France, Germany, Italy, Japan, UK, USA, Canada, EU) concluded an agreement in June 2015 calling on UNFCCC meeting in Paris to make a global emissions reduction target at the “upper end” of the 40-70% reductions which the Intergovernmental Panel on Climate Change (IPCC) has said are necessary to keep global warming within 2 degrees centigrade.⁴

The final text of the Paris Agreement does not specify country emissions targets but requires each country to set its own targets with a commitment to reviewing them at five yearly intervals so that ambition can be ratcheted up over time. The Paris Agreement is a *confederation agreement*: each nation state governs itself but agrees to work towards a common cause. In this case the common cause is to keep global average temperatures well below 2°C and endeavor to limit warming to 1.5°C. Further work is now needed to quantify precisely the increased emissions reductions needed to meet the 2/1.5°C goals, but it is clear that to deliver this target requires that global greenhouse gas emissions go to net zero (any emissions balanced by absorbing an equivalent amount elsewhere) *before* the end of this century. At present, the Intended Nationally Determined Contributions (INDCs), which are the public statements of planned actions to reduce emissions by different countries prepared for the Paris meeting, are insufficient to deliver the 2°C target, let alone 1.5°C.

⁴ Conolly, K., ‘G7 leaders agree to phase out fossil fuel use by end of century’, *The Guardian*, 8th June 2015.

The economic benefits of a move to clean energy

The IPCC 2014 report notes that well-designed policies to reduce greenhouse gas emissions could also deliver:

“reduced costs for achieving air quality and energy security objectives, with significant co-benefits for human health, ecosystem impacts and sufficiency of resources and resilience of the energy system.”⁵

The potential impact of climate change on public health is highlighted in a June 2015 Lancet Commission report ‘Health and climate change: policy responses to protect public health’:

“The implications of climate change for a global population of 9 billion people threatens to undermine the last half century of gains in development and global health. The direct effects of climate change include increased heat stress, floods, drought, and increased frequency of intense storms, with the indirect threatening population health through adverse changes in air pollution, the spread of disease vectors, food insecurity and under-nutrition, displacement, and mental ill health.”⁶

There is increasing evidence that reducing climate risk will prevent economic damage. The Stern Review made this argument back in 2006:

“The benefits of strong, early action on climate change outweigh the costs”⁷.

In the nine years since then, many countries have demonstrated how this can be achieved. The 2015 report of the Global Commission on the New Climate Economy, co-chaired by former Mexican President Felipe Calderon and Lord Stern, notes that:

“new patterns of international production and trade, demographic change and technological advances have dramatically altered the shape of the global economy over the last two decades. “Business as usual” is thus no longer an option. Structural change is inevitable – but that change can be steered to make economies at all levels of development stronger, more equitable, more sustainable and more resilient.”⁸

Climate action therefore offers significant economic opportunities. It also offers significant business opportunities. Former CBI Director-General, John Cridland, is a longstanding advocate of ambitious climate policies – a trait he shares with his predecessors Richard Lambert and Adair Turner. In his foreword to the CBI publication ‘A climate for growth: securing a global climate deal in Paris’, Cridland writes:

⁵ IPCC, ‘Climate change 2014 Synthesis report for policy makers’, 2014.

⁶ Watts, N., et al, ‘Health and climate change: policy responses to protect public health,’ *The Lancet*, Volume 386, No. 10006, 7 November 2015.

⁷ Stern, N. H, ‘Stern Review: The economics of climate change’ (Vol. 30). London: HM treasury, 2006.

⁸ Global Commission on the new Carbon Economy, ‘New carbon economy report 2015’, 2015.

“Climate change is one of the most critical issues facing business and society. Both the science and the economics are clear: we must act now, or pay a greater price later. Business knows that it must be part of the solution, and is already developing new and innovative ideas, products and processes to cut emissions and create a more resilient economy. And we also know that in tackling the climate challenge there is a huge prize to be won, with the global green market worth £3.4 trillion.”⁹

In contrast, climate inaction carries significant economic risks. IMF managing director Christine Lagarde calls climate change:

“by far the greatest economic threat of the twenty-first century.”¹⁰

Governor of the Bank of England Mark Carney warned in September that investors face huge climate change losses.¹¹

Investments in the energy sector are for the long-term – transport and energy infrastructure can take years to plan and construct but then can operate for decades. The UK’s carbon budgets and 2050 target are a good example of how to increase investor confidence, so lowering the cost of capital.

Investors, in particular, are becoming vocal about the need for clear long-term goals. In December 2015, nearly 400 institutional investors, holding over \$24 trillion in assets called for:

“...Strong political leadership to provide certainty to investors by committing to a clear long-term goal. This will enable investors to deploy more capital and unleash a wave of innovation...The transition to the low-carbon economy is inevitable, irreversible and irresistible.”¹²

Well-designed climate and energy policies could therefore deliver significant economic and employment benefits to the UK. It is beyond the scope of this paper to detail what these policies should be, but the basic principles are now well established and simply extend analysis undertaken about how to meet 80% targets whilst retaining a strong economy. For example, a 2014 report on ‘Pathways to Deep Decarbonisation’ recommends three pillars of energy system transformation: energy efficiency and conservation, decarbonising electricity, fuels and industrial processes and switching end uses to low-carbon supplies.¹³

⁹ CBI, ‘A climate for growth. Securing a global climate change deal in Paris’, 2014

¹⁰ King, E., ‘IMF chief Lagarde warns of “merciless” climate change’, Climate Home, 5th February 2014.

¹¹ Clark, P., ‘Mark Carney warns investors face ‘huge’ climate change losses’, Financial Times, 25th September 2015.

¹² Investors on Climate Change, 2015 <http://investorsonclimatechange.org/wp-content/uploads/2015/10/Now-is-the-Moment.pdf>

¹³ ‘Pathways to deep decarbonisation 2014 report’, The Deep Decarbonisation Pathways Project, 2014.

The 2008 Climate Change Act and the Committee on Climate Change

Policies and delivery are more important than targets – in climate as in other policy areas. Nevertheless, targets can be beneficial in shaping policy design and in ensuring that policy-makers have a sufficient level of ambition, and that short-term calculations do not crowd out long-term considerations.

With the Climate Change Act 2008, the UK became the first country to set itself a binding commitment to future emissions reductions. The Act had strong cross-party support – only five MPs voted against – and was also supported by the CBI, the TUC and many civil society organisations. The draft Bill had proposed a 60% reduction in greenhouse gas emissions (from 1990 levels) by 2050. During the passage of the Bill the Department of Energy and Climate Change (DECC) was established, and an amendment was accepted that increased the long-term target to 80%.

The Climate Change Act established the Committee on Climate Change (CCC) to advise the UK parliament and government, and devolved parliaments and governments, on targets and carbon budgets – the appropriate levels of greenhouse gas emissions to aim for over five-year periods leading up to 2050. The CCC was formally established in December 2008 when the Climate Change Act became law. But the CCC had been operating informally before that, and was influential in persuading DECC to increase the target from 60% to 80%.

The CCC's role is to advise on budgets, not to recommend policies or support particular technologies. Indeed, committee members are discouraged from voicing strong opinions for or against specific policies or technologies. This has enabled CCC to avoid the technology tribalism that bedevils so much energy and climate debate. It sets out options, for example in its recent 'Power Sector Scenarios for the Fifth Carbon Budget'¹⁴ This report is primarily analysis, but it does contain an important statement:

"a portfolio approach is appropriate".

In other words, the sensible approach is not solar or wind or biomass or marine renewables or nuclear or carbon capture and storage (CCS), but all of the above in so far as they prove effective and affordable.

The CCC's first chairman was Adair Turner, who had been CBI director-general in the late 1990s, so was ideally placed to answer criticisms that climate action is anti-business. Adair Turner was appointed to the House of Lords in 2005, and became a cross-bench peer. Lord Turner stood down in 2012 and was succeeded by Lord Deben, John Gummer, the former Conservative Environment Secretary. There are no differences of principle on energy and climate policy between Conservatives, Labour and Liberal Democrats: all support an 'all of the above' technological approach. But there are significant political debates about implementation, particularly about the handling of subsidies. The Committee's advice sits above these political considerations and advises on the most cost-effective pathway to meeting our legislated long-term goals.

¹⁴ Committee on Climate Change, 'Power Sector Scenarios for the Fifth Carbon Budget, October 2015. <https://www.theccc.org.uk/publication/power-sector-scenarios-for-the-fifth-carbon-budget/>

Leading by Example

A 2009 report by environmental lawyers Client Earth, 'The UK Climate Change Act – Lessons for national climate laws',¹⁵ notes that:

"The Act...addresses the practical concern that climate change is a long-term problem. By putting a long-term framework into legislation the Act can help to overcome the tendency of political and electoral systems to favour short-term approaches. In the UK, specific concerns had been identified where political targets for emissions reductions were not carried through in subsequent action and policy."

Client Earth also note that the Act had symbolic as well as practical value:

- *"A key motivation for the UK government in passing national climate legislation was to demonstrate nationally and internationally its leadership and commitment to long-term action on climate change and to encourage commitments from other countries as part of an international agreement. The Act accordingly has a symbolic value by putting commitments on climate change into legislation."*

The Climate Change Act was effective international leadership: many countries have followed the UK's example since 2008. To give one example, in 2014 Finland adopted a Climate Change Act setting a legally binding target to cut greenhouse gas emissions by at least 80 per cent by 2050. The Grantham Institute published a report in 2015 which considered climate legislation in 99 countries and found 45 countries (including the EU as a block) have economy wide targets to reduce their emissions, together accounting for over 75 per cent of global emissions¹⁶.

¹⁵ Hill, K., 'The UK Climate Change Act – Lessons for national climate laws. An independent review by Client Earth', Client Earth, November 2009

¹⁶ Nachmany, M., 'The 2015 Global Climate Legislation Study. A Review of Climate Change Legislation in 99 Countries', 2015.

Why should the Climate Change Act target be strengthened?

Given the recent Paris Agreement and advances in scientific understanding since 2008, is there a case for a more ambitious greenhouse gas reduction target?

A 100% greenhouse gas reduction target is a net zero target: in other words, the total annual addition of emissions of human-induced greenhouse gases¹⁷ to the stock in the atmosphere is equal to zero.

It is technically possible for the UK to deliver a net zero greenhouse gas emissions target.

Demand side

This would require stronger “demand side” reductions. In other words, we need to reduce the energy we require to meet a particular energy demand (such as having warm homes or mobility around and between cities). We can do that by improving energy productivity: for example, by having homes that require near zero net energy requirements to maintain appropriate warmth or cooling. And/or we need to reduce our aggregate demand for these energy services. In other words, there is much we can do to substantially reduce our energy requirements whilst still meeting current social norms – which goes a long way towards a net zero target. But we also know that social processes and cultural changes and technology develop together: so we can anticipate changes in social norms over the next few decades. We will need to work with and influence social processes and cultural preferences for delivering emission reductions over coming generations.

In a net zero world, many of the remaining greenhouse gas emissions arise from food production processes (equivalent to nearly 30% of per capita emissions in 2050). As in the energy demand example above, the choices are likely to involve both making the food production processes more energy/carbon productive (per unit of food), and influencing social and cultural norms about what food we eat (dietary preferences).

Carbon Intensity

Having increased efficiency and reduced demand, the energy we continue to use must be decarbonised. The carbon intensity of electricity in particular will need to be as close to zero as possible in order to allow for electrification of transport, heat and industrial processes. We can reduce energy-related greenhouse gas emissions close to zero by the use of nuclear, renewable technologies and/or carbon capture and storage (CCS) technologies. CCS can include the injection of carbon dioxide into geologic formations, for example, beneath the North Sea; or mineralisation of greenhouse gases within chemically stable materials¹⁸. Globally, there are 15 large-scale CCS projects in operation, with a further seven under construction.¹⁹

¹⁷ As defined in Annex A of the Kyoto Protocol of the United Nations Framework Convention on Climate Change

¹⁸ Sandbag. 2015. *The CO2 Economy: Mineral Carbonation Technology Overview*.

<https://sandbag.org.uk/reports/co2-economy-mineral-carbonation-technology-overview/>

¹⁹ GCCSI, 2016. Large-scale projects. <http://www.globalccsinstitute.com/projects/large-scale-ccs-projects>

A report by the 'Deep Decarbonisation Project' being run out of University College London is expected to publish a report on options for the UK early in 2016.²⁰

Negative emissions

Other industrial or land use processes have inherent greenhouse gas emissions and even if heavy industry uses CCS, this would cut emissions by around 90% but not to zero. There would be no climate benefit, and significant economic cost, to force remaining heavy industry to relocate to other countries with laxer regulatory regimes. Around 9% of UK emissions come from agriculture. Again, we know how to dramatically reduce these emissions, but not how to eliminate them entirely. In these cases 'negative' emissions, or anthropogenic sinks, will need to be delivered to compensate for residual emissions.

We can achieve a net zero target by matching these residual industrial/land use emissions through:

1. absorbing an equivalent amount of carbon dioxide over time, for example by sustainable planting of additional trees to deliver a net increase in absorption;
2. increasing the rate by which carbon dioxide is removed from the atmosphere, for example by capturing and storing carbon dioxide from bioenergy;
3. helping increase the global pace of decarbonisation by helping other countries to increase their rate of carbon abatement or absorption.

"Carbon negative" technologies will need to be further commercialised. Different forms of these approaches or technologies already exist today: for example, afforestation or CCS on bioenergy generation. But these "carbon capture" technologies – whether biological or technical – will need to be expanded and scaled up to a degree not seen to date, in some cases because of technological challenges but more commonly because the business case does not make commercial sense in present economic conditions.

²⁰ <http://deepdecarbonization.org>

Conclusion

The Climate Change Act is a powerful piece of legislation, but not perfect. The 2009 Client Earth report²¹ warns that:

“by leaving the question of whether to amend the target to the discretion of the government, the Act lacks a legal trigger for ensuring the target is kept up-to-date. The CCC has indicated that because of uncertainties surrounding the judgments about the 2050 target, adjustments to the 2050 target may be needed over time, for instance if climate modelling or actual temperature trends suggest increased danger points or if actual emissions diverge from modelled trajectories.”

Climate change milestones are now evident. The Met Office has said that in 2015:

“global average temperatures are poised to surpass the milestone of 1 degree Celsius above pre-industrial levels”²²

Extreme weather events are becoming more common, with the record-breaking rainfall of December a good example. And remarkably there were no air frosts during December across southern England²³. In the UK, there are discernible changes in weather patterns. Short-term weather is not the same as long-term climate. Nevertheless, trends are emerging both in the UK and around the world.

It is increasingly clear from the scientific evidence discussed above that, if we are to have a reasonable chance of keeping warming well below 2°C, global net zero emissions will be required at some point between 2050 and 2100.

At the same time, investors and businesses are seeking long-term clarity to enable effective allocation of resources. A stronger commitment to reducing emissions, with a net zero target, will deliver a stronger economy, not a weaker one, with clear related social and environmental benefits.

Adding a net zero target for the UK to the existing -80% target in the Climate Change Act would align the intended policy outcome with cross-party political statements about wishing to meet a 2°C global target, and with the UK's own commitment to the Paris Agreement. It would also provide a clear signal about the long-term direction of travel of UK policy to businesses and investors. Clarity of long term intentions, with allied and consistent policy frameworks, provides certainty for enterprise innovation and investment, so reducing the cost of capital and cutting energy bills.

In 2008 the UK parliament led the world by passing the Climate Change Act. Following the adoption of Paris Agreement, Parliament has an opportunity to show leadership again by strengthening the ambition in that Act to a net zero target, on a timescale to be advised by the Committee on Climate Change.

²¹ Hill, K, 'The UK Climate Change Act – Lessons for national climate laws. An independent review by Client Earth', Climate Earth, November 2009.

²² <http://www.metoffice.gov.uk/news/release/archive/2015/one-degree>

²³ <http://www.metoffice.gov.uk/climate/uk/summaries/2015/annual>