ROYAL ACADEMY OF ENGINEERING

Climate Change: public understanding and its policy implications

A response to the House of Commons Science and Technology Select Committee

April 2013

1. The Royal Academy of Engineering is pleased to respond to the Science and Technology Committee's inquiry into the public understanding and policy implications of climate change policy. This response has been prepared following consultation with a number of our Fellows with expertise in this area, both in industry and academia.

2. The Academy's expertise in this field is primarily in the implications of climate change policy for the UK's energy system, from energy generation to the systems that use it, and also the challenges of adapting the UK's infrastructure and built environment to the impacts of a changing climate. The scale of these implications, as driven by policies such as the Climate Change Act 2008, will require a radical change in the energy system that will not be achieved without the engagement of the public. The Academy's 2010 report, *Generating the Future*[1], gives some idea of just how massive these changes will be: such change requires support and acceptance by society.

3. Without a broad awareness of the severity of the problem of climate change, it may be very hard to generate public support for the necessary measures to mitigate and adapt. Climate, energy and the economy are intricately linked, with each having a direct bearing on people's sense of wellbeing and prosperity. Forcing rapid and significant changes on the energy system will inevitably result in a negative reaction from those who are expected to bear the cost and whose lives will be affected by the resulting major infrastructure projects. This is particularly the case when the current system has functioned well and appeared to be relatively stable for over a generation. However, perceptions will have been affected by a number of issues and global events including the long-running economic downturn, the emergence of shale gas in the US, the Fukushima incident in Japan and a failure to agree a successor to the Kyoto Protocol. The situation is unlikely to be any less dynamic in the future.

4. The climate is an incredibly complex, dynamic system and conveying information about it, and how human beings are affecting it, is extremely difficult. The chaotic nature of the climate will mean that fundamental uncertainties will always remain despite our increased understanding of the system. In fact, recent insights into feedback mechanisms may even have increased levels of uncertainty[2]. Even the most basic of terminology can create problems. The term 'climate change' can lead to confusion because what is generally meant by this term is anthropogenic (ie caused by human beings) climate change but the abbreviated term can appear to ignore the fact that the climate has always been changing. It also fails to convey anything about how fast or extreme the changes will be. Similarly, the term 'global warming', which refers to the long-term trend in average global surface temperatures, can be misinterpreted as an expected steady year-on-year increase in temperatures, which is not what has been seen.

5. However, the real effects of climate change are extreme variations in weather, and these are in fact more likely to be noticed by the public rather than long-term temperature trends. Recent years have provided clear indications of this which are in the public consciousness. One example of severe weather risk is the impact of tropical storms on the eastern US seaboard. Storms such as Katrina and Sandy caused almost 2,000 deaths and costs of over $100bn[3]. Attributing these extremes in weather to anthropogenic climate change can be difficult, but several studies have increasingly found evidence that this is the case. See, for example: Hansen et al, *PNAS* 2012[4]; Pall et al, *Nature* 2011[5]; and Otto et al, *Geophysical Research Letters* 2012[6]. Framing the climate change issue in terms of

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[1] www.raeng.org.uk/news/publications/list/reports/Generating_the_future_report.pdf
[2] www.nature.com/climate/2010/1002/full/climate.2010.06.html
[3] www.bloomberg.com/news/2012-11-05/sandy-s-power-dwarfed-by-katrina-s-gutting-of-the-gulf.html
[4] www.pnas.org/content/early/2012/07/30/1205276109.full.pdf
[5] www.nature.com/nature/journal/v470/n7334/full/nature09762.html (note: this link is not working in the document and will need to be copied directly into a browser)
[6] www.agu.org/pubs/crossref/pip/2011GL050422.shtml

these kinds of identifiable (and recently experienced) risks may help raise awareness and appreciation of the problem. However, care must be taken as not all extreme weather events can be attributed to anthropogenic climate change. The 2012 US drought appears to be one such non-anthropogenic event[7].

6. Terms relating to the technology needed to limit the effects of climate change such as 'renewable', 'low-carbon', 'clean' and 'sustainable' can also lead to confusion. However, the prudence of using less energy (and therefore saving money) and using renewable resources rather than finite supplies of fossil fuels that are subject to global supply pressures and volatile prices, may in itself be a good argument for using lower carbon energy. Such an approach may be more likely to succeed since it describes benefits that will accrue to the individuals rather than society at large.

7. A number of organisations and individuals have attempted to tackle the difficult task of explaining climate science. The work of the IPCC is generally seen as being the best assessment of the current understanding of the science. In the UK, the Committee on Climate Change and academic organisations such as the Met Office Hadley Centre and the Grantham Institute for Climate Change are respected sources of information. These, however, tend to produce quite technical reports that may not be widely read other than by experts or interested parties. The Royal Society has produced a more accessible summary of the science of climate change[8] and successive Government Chief Scientific Advisors have kept climate change high on the list of priorities both in government and the media. Departmental Chief Scientific Advisers should be encouraged clearly and publicly to articulate the evidence, in support of the GCSA. Professor David MacKay's publication, *Sustainable energy without the hot air*, is a good example of how to do so in the area of energy policy. Such voices have to compete, however, with the many other voices in the media that, in some cases and for various reasons, emphasise the extremes of the argument.

8. There is an obvious tension in seeking to persuade the public that large sums of money need to be spent now to address a problem that is full of uncertainty and long-term in nature. The problem needs to be recast in terms of risk management encompassing all aspects of mitigation and adaptation. This would include additional uncertainties relating to primary fuel supplies, available generating capacity and imports of energy. All these issues combine to make the development of a functioning UK energy system an enormously complicated problem. Technologies do exist and can be developed that, with sufficient engineering skills and ingenuity, can address the challenges. But there is no 'magic bullet' and a certain amount of disruption and cost is inevitable. What is vital, but challenging, is a consistent message from all parties that does not shy away from these difficulties and uncertainties. Government, industry, academia and learned bodies all have a role to play in providing the public with a coherent message. Consistency across government departments and policies is particularly important.

9. The 'public' includes people from many different groups and all walks of life, whose daily work and business will need to change in the effort to limit carbon emissions. Engineering will be at the heart of the efforts to do this, and it will affect and make demands on stakeholders throughout the engineering supply chain and including clients and customers. For example, the recent Green Construction Board Routemap indicates that reducing carbon emissions in the built environment by 80% will require the whole construction industry to do everything that is economic and sensible, particularly in retrofitting existing

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7 www.drought.gov/media/pgfiles/DTF%20Interpretation%20of%202012%20Drought%20FINAL%202%20pager_V4.0.pdf

8 royalsociety.org/uploadedFiles/Royal_Society_Content/policy/publications/2010/4294972962.pdf

building to improve their efficiency. This is going to require an immense rethink in construction, affecting businesses from large consultancies to self-employed builders.

10. Government does need a greater understanding of the techniques of engaging openly with the public and of what drivers can affect society on a large scale. Currently, a number of departments have their own external behavioural advisors, but they do not share a consistent approach.

11. Another challenge is raising public awareness of international strategies needed to address what is a global problem. The UK's direct greenhouse gas emissions constitute around just 3% of the global contribution. One can understand why the public, and indeed government, might weigh this relatively small contribution against economically disadvantaging the UK in the global economy. However, the Climate Change Act's 80% emissions reduction target is based on an equal share per person of an assumed global emissions ambition by 2050. A positive message to promote is that the UK can play a significant role in providing technologies and thought-leadership to address the global issue and, to be taken seriously in this, must set a good example with its own greenhouse gas emissions. It is clear that the changes required cannot happen without widespread acceptance of impacts on lifestyle and behaviours.

12. The nature of public dialogue on climate change must move beyond arguments over the science, to engage the public in debate on the political, technological and lifestyle changes that are needed to deal with its effects. In this sense, a number of issues arise. What are the possible options available to reach this target and what are the pros and cons of each? What should the UK's role and ambitions be in relation to other nations and the rate at which we decarbonise? How does climate change relate to other environmental issues such as resource depletion, population growth and pollution? Will energy prices inevitably increase, and how can this be reconciled with groups such as those in fuel poverty and energy intensive industries?

13. Many of these issues will require difficult and complex solutions, but the public may generally be better informed of and receptive to the difficulties than they are given credit for and better levels of education in science and technology can only serve to improve this level of understanding. Framing the dialogue in specific terms - for example, that better energy efficiency and less waste has clear advantages, especially in times of austerity – could enable more people to come on board with the debate.