The Royal Academy of Engineering

Committee on Climate Change: Call for Evidence

Response from The Royal Academy of Engineering to the Department for Environment, Food and Rural Affairs

January 2008

1. **Carbon Budgets: Which modelling approaches (e.g. cost-benefit analysis) and practical issues (e.g. international agreements to reduce emissions) should the CCC consider so as to ensure the budgets it proposes are deliverable and socially optimal?**

   The targets set on the initial three five year 'carbon budgets' are clearly the most important aspect which the Committee on Climate Change will advise on. It is important that these national targets are in alignment with other international commitments such as the Kyoto Protocol (and any potential successor) and targets set by the European Commission. However, the current scientific thinking on climate change, as exemplified by the IPCC Fourth Assessment Report, suggests that all possible measures will be needed so as to achieve the greatest possible reductions in the fastest possible time.

   These reductions must be delivered in a market place where primary fuel costs are uncertain, where the fuel mix will change regularly and where the energy conversion processes will become more expensive as new technology is deployed to reduce greenhouse gases. The overall economic impact will therefore be quite difficult to model with any degree of certainty. Models can be determined for particular sectors and technologies to include sensitivity to fuel and carbon price. Such models could identify first order assessments of the economic impact as a means of aiding judgements, however, these analyses should be used with caution in trying to determine priorities and outcomes.

   An alternative approach is to allocate targets in line with what is technologically possible and then to identify the fiscal and regulatory measures necessary to achieve these targets. This approach would be of particular relevance in the electricity generation sector. Here, a number of different low-carbon technologies exist, such as nuclear power, renewables and carbon capture and storage. Each of these technologies has the potential to greatly reduce emissions, but each has their own particular problems and uncertainties due to the level of maturity of the technology, the engineering practicalities and the social acceptability. The potential of each of these technologies is relatively straightforward to model. However, given the uncertainty of future fuel prices, global supply chains and technological advances, extensive consultations along with continued reassessment would be required.

   Whichever approach is adopted, it is crucial that the full reduction trajectory to 2050 and beyond is considered. Early reductions will have a greater effect on reducing atmospheric concentrations of greenhouse gases but significant technological solutions may not be feasible until further down the line. When setting the budgets, a balance must be found which achieves the best long-term outcome.

   It is also important that the Committee is entirely transparent with its procedures. The targets it sets will be challenging for industry, businesses and the population at large. A full explanation of how the targets have been reached will therefore be required if the necessary support is to be secured.

2. **Transport: What is the potential for cost effective CO_2 emissions abatement in transport and where might that potential lie?**

   With transport being the only sector where emissions of carbon continue to rise, it is crucial that ways of reversing this trend are found if significant national cuts are to be achieved. Potentially, cuts can be made in two areas, either by

technological changes or by changes in personal behaviour.

In terms of technology, general advances in efficiency will continue to bring emissions savings in all forms of transport. However, there is a limit to what can be achieved from this approach as most vehicles, particularly cars and aircraft, are already highly developed machines.

Much greater reductions in emissions could be realised by changes in the types of fuel used. Currently, the majority of transport is run on derivatives of oil with associated high emissions of CO_2. Various alternatives are being developed such as biofuels, hybrid electric drive trains and hydrogen. Each of these has the potential to significantly cut CO_2 emissions, but each also has possible problems associated with it as, for example, recent reports on biofuels have shown.

While technology has the potential to greatly reduce emissions from transport, much of the recent rise from the transport sector come from the fact that, both globally and nationally, people travel more for both work and leisure. Hence, any gains made from greater efficiencies or alternative fuels risk being nullified by increases in mobility. A variety of measures to combat this could be implemented, such as: promoting the use of public transport; changing working practices and encouraging the uptake of energy efficient vehicles.

Finally, air transport is seen as a particularly difficult and important challenge given its dependence on fossil fuel and its rapid growth. Here, there is scope for emissions reductions, both through more efficient aircraft and air traffic management. However, while emissions from aviation are not included in national carbon inventories and the aviation industry is not part of any emission trading schemes there will be little incentive to cut emissions in this sector.

3. Carbon Markets: What are the main price drivers in the European carbon market? What is the balance of abatement potential through carbon markets within and beyond the EU?

The main drivers for the carbon market in Europe are the caps set by the European Commission within its Emission Trading Scheme and the subsequent allocation of allowances by each member state. This is a crucial mechanism for future abatement policies and although there have been problems in the first phase of the scheme, primarily from over generous allowances, it is important to continue to support and strengthen the scheme.

As more of Europe's emissions are included in the scheme and the market matures, the price of carbon should strengthen. This will afford industry a greater degree of certainty when developing low-carbon technologies and committing funds to future R&D programmes.

It is also important that countries be allowed to continue to invest in and be credited with emissions reduction projects in developing countries, as is the case with the Clean Development Mechanism of the Kyoto Protocol. However, any such project must clearly meet the conditions of additionality, i.e. that the projects will effect a reduction in greenhouse gas emission which would not otherwise have occurred. It is also important that such allowances do not stand in the way of the decarbonisation of the UK economy.

4. Energy End-Use: What is the potential for cost-effective CO2 emissions abatement from improvements in energy efficiency in the domestic, public

and business sectors; and from microgeneration, non-industrial CHP and renewable heat; and what are the challenges for achieving emissions reductions in these sectors?

Reducing energy demand is an important part of the overall strategy for significantly reducing the UK's emissions of greenhouse gases. There is much scope to promote energy efficiency in the construction sector through regulation and subsidies. Technologies such as CHP, ground source heat pumps and smarter metering all have the potential to reduce emissions as well as more traditional measures such as better insulation. Once installed, these can also provide energy savings and help to reduce levels of fuel poverty.

However, while it is certainly important that new buildings are constructed to the highest possible levels of energy efficiency, it is even more crucial to deal with the existing stock of buildings. New build only accounts for a small proportion of the total stock and if significant cuts are to be made in reducing energy demand, effective ways of retro-fitting building with emissions reduction measures will need to be found.

5. **Emission Projections (energy): What will be the key drivers behind the UK's CO_2 emissions over the period from now to 2022? What is the likely impact of GDP growth, changing structure of the UK economy, household structure and demographics on future emissions? How are power sector emissions likely to evolve over the first three budget periods?**

   In the absence of additional regulation and fiscal measures, emissions are likely to grow in line with historical trends. Energy use and GDP are often closely correlated. Thus, in order to achieve deep cuts in greenhouse gas emissions while maintaining our standard of living, measures must be implemented to fundamentally decarbonise the economy and de-couple energy and GDP.

6. **Greenhouse Gases (non-energy): What cost-effective abatement opportunities for non-CO_2 gases are likely to become available between now and 2050 through innovation/technological developments? What are the challenges in unlocking this abatement potential?**

   Good progress has been made in reducing methane from landfill and this should continue. Scope for reductions in other areas is limited.

   Oxides of nitrogen (NOx) can be reduced to very low levels for all ground based energy conversion process. Aviation poses a more difficult challenge but further progress is possible which would at least be sufficient to offset traffic growth. However, reductions in NOx emissions often come at the cost of increased fuel burn and hence higher CO_2 emissions, thus it is ultimately a questions of balance.

7. **Technology Path to 2050: To what extent is there a risk of lock in to high carbon technologies as a result of investment decisions to be taken during the first three budget periods? What are the promising low carbon technologies for deployment in the period to 2050, and what are the key factors in supporting technology development?**

   Technology lock in is potentially a major problem, particularly in sectors such as electricity generation and housing where the timescales for replacement are long.

In electricity generation, the most important technology is likely to be carbon capture and storage (CCS). Globally, there are still abundant reserves of fossil fuels, especially coal. CCS is the only technology which will enable coal fired power plants to significantly reduce their carbon emissions. Continued support for a series of full scale demonstration plants employing a variety of CCS options should therefore be encouraged.

In the transport sector there is less danger of lock in for the vehicle fleet which has a relatively fast replacement rate. However, there is a danger of lock in of first generation biofuels which may hinder the move to second generation fuels.

8. Budget Costs and Benefits: How will carbon budgets affect economic, social, fiscal and regional circumstances, and the government's energy policy goals, and how should the budgets be set to appropriately balance the costs and benefits to these factors?

Nothing to contribute to this question.

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