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Government Response to the Economics of Climate Change

Report

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Government Response to the Second Report of the Lords Economic Affairs Select Committee, Session 2005-2006

THE ECONOMICS OF CLIMATE CHANGE

The House of Lords Select Committee on Economic Affairs published its report “The Economics of Climate Change” on 6 July 2003. The Government response is printed below in the Appendix.

APPENDIX

GOVERNMENT RESPONSE TO THE SECOND REPORT OF THE LORDS ECONOMIC AFFAIRS SELECT COMMITTEE, SESSION 2005-06

Introduction

Response to paragraph 2 of the Report

1. We welcome the Government's recognition of the central role of economics in considering climate change. But we believe that the Chancellor needs to broaden the scope of the Government's interests, and the Treasury's interests in particular, in aspects of the climate change debate that we feel have not yet been given sufficient emphasis (paragraph 2).

We disagree. The Government has adopted a coherent approach to the development of climate change policy. This approach has drawn on the scientific evidence base on climate change to inform Government action. The economics of climate change has also been central, and Treasury has since the outset played an integral role in the development of UK climate change policy. The Chancellor recognised that the debate on the economics of climate change would benefit from the clarity of an independent review, and that is why he announced a review of the economics of climate change to be led by Nick Stern. The review will look at the medium to long term economic implications of climate change and assess approaches to tackle the issue.

Response to paragraphs 2 and 3 of the report

2. We are concerned that the links between projected economic change in the world economy and climate change have not been as rigorously explored as they should have been by the IPCC. We believe the complex interactions between world economic growth and climate change need additional scrutiny at the international level, and that the UK Government has a role to play in ensuring that this happens. We are also concerned that clearer messages should be conveyed to the public about the likely costs and benefits of climate change control, who will bear those costs and benefits, and when (paragraph 2).

3. We are not convinced that there is sufficient public awareness of the economics of climate change. Any public misperception on these issues could threaten the political feasibility of getting plans of action put into effect. If climate change is as serious as most scientists claim, and as the Government accepts, then it is important to convey the complementary message that the action to tackle it will also have to be serious and potentially life-changing. It is better to be honest now than to shield the public from the economic realities inherent in the more pessimistic forecasts (paragraph 3).

The Intergovernmental Panel on Climate Change's (IPCC) role is to assess the available scientific literature including the socio-economic literature. It does this rigorously, following procedures agreed internationally including a two stage, fully

documented peer review process. There is nothing comparable internationally with this level of scrutiny and the UK Government was instrumental in setting it up.

This Committee has devoted considerable attention to the critique of the links between projected economic change in the world economy and climate change in the IPCC scenarios. The Government notes that most commentators have reached the conclusion that any change in the emissions projected by the scenarios—which reflect uncertainties in the future projections of economic growth—is likely to translate into a very small effect on projected temperature. Overall, the IPCC’s emissions scenarios cover a very wide range and the most reasonable expectation about future global emissions, in the absence of further mitigation action, is likely to be included within the envelope.

Assumptions about global economic growth in the IPCC scenarios have been commented on widely. The IPCC is currently assessing these scenarios in the light of the literature now available. The Government fully supports the continuous improvement of the IPCC scenario work, including addressing the complex issues that have been raised in relation to socio-economic scenarios. To strengthen understanding of the implications of economic growth on climate change, Nick Stern’s review will examine the prospects for global growth and in particular the implications this has for energy demand and emissions.

At all stages, the Government has openly consulted on cost implications of climate change policies and sought stakeholder views on their validity. New policies are accompanied by an open and consultative Regulatory Impact Assessment (RIA) process. There are other sources of cost information such as the forthcoming Climate Change Programme Review (CCPR) and accompanying evaluations.

The Government does not underestimate the long-term challenge of shifting to a low-carbon economy. The Energy White Paper acknowledges that securing our objectives is a “massive challenge”. The costs of a low-carbon economy are covered by modelling work for the White Paper, and the estimates are broadly in line with the broader literature. An updated review of this modelling literature by the Imperial College London Centre for Energy Policy and Technology (ICEPT) has recently confirmed that these longer-term estimates remain fairly central.¹

The publication of the Stern review next year will provide an opportunity to present the argument to the public on costs of action and inaction.

The uncertain science of climate change

Response to paragraph 18 of the Report

4. The scientific context is one of uncertainty, although as the science progresses these uncertainties might be expected to diminish and be resolved, one way or the other. Hence it is important that the Government continues to take a leading role in supporting climate science, and encourages a dispassionate evidence-based approach to debate and decision making (paragraph 18).

Whilst uncertainties exist, it should be recognised that the consensus on the reality of climate change, its causes and effects, is growing ever stronger, as witnessed by the IPCC’s Third Assessment Report, The Exeter conference on “Avoiding

¹ Imperial College London Centre for Energy Policy and Technology (ICEPT), September 2005, *Options for a Low Carbon Future: Review of Modelling Activities and an Update*, DTI Occasional Paper no. 1.

Dangerous Climate Change” and more recently the Joint Science Academies’ Statement of June 2005. The remaining uncertainties are about the magnitude and timing of future climate change.

We agree completely that it is important that the Government continues to take a leading role in supporting climate science. Defra (Global Atmosphere Division) funds a substantial—and dispassionate—research programme at the Met Office’s Hadley Centre, a centre of world-renown. Its value is currently £11 million per annum; this funds about 70 staff and substantial use of the powerful supercomputer necessary for modelling climate. Whilst Defra help officials identify priority work areas and the type of information which government needs, Hadley Centre scientists are independent and objective. They are encouraged to publish their findings in peer reviewed journals, and have an impressive publication record. Hadley Centre model output is subject to stringent scrutiny both internally (all versions of the models are validated against real-world observations) and externally; their work frequently features in international model intercomparison exercises. An independent, international Science Review Group provides independent scrutiny of Hadley Centre’s work, as well as major five-yearly reviews of not only the programme but also how well it meets Government’s needs.

Defra’s climate research is only part of a larger UK research activity coordinated with the Research Councils via the Global Environmental Change Committee. Many National Environment Research Council (NERC) scientists collaborate with Hadley scientists; indeed many of the publications mentioned above are co-authored. Likewise the Defra-funded work at the Hadley Centre relies greatly on the MOD-funded components of the Hadley Centre’s work. In addition to the work of the Hadley Centre, significantly more government money is used to fund a wide range of climate science projects through the NERC.

Response to paragraph 24 of the Report

5. We do not believe that today’s scientists are “crying wolf” about climate change: they may turn out to have been wrong in some respects, but arguments on which they base their case are better researched than in earlier cases. That said, we have sought to highlight some pressing issues which we believe deserve a further response from the scientific community in order to enhance understanding and resolve current controversies (paragraph 24).

The Committee has highlighted the “hockey stick” debate as an example of controversy. This is just one example of normal debate in a dynamic science. Another recent example is the apparent discrepancy between surface and tropospheric temperature trends which has recently been resolved by more robust analysis of tropical satellite and balloon-borne data.

Defra funds Hadley Centre scientists to investigate these and other issues which rightly receive attention from the media and experts. Mann *et al*’s original work on the “hockey stick” has now been re-analysed and replicated by their peers for some years and has not been discredited. It is just one of numerous strands of evidence that make up the emerging picture of historic climate change. Contrary to some reports, the “hockey stick” diagram was not crucial to the IPCC’s Third Assessment Report conclusions. The Met Office considers that it is still most likely that the 1990s was the warmest decade in the last 1000 years and that more than 50% of warming in recent decades is attributable to anthropogenic sources of greenhouse gases.

The future impacts of the enhanced greenhouse effect

Response to paragraphs 27 and 47 of the Report

6. Whatever the validity of temperature projections, the science of measuring impacts remains speculative. Many of the adverse effects of warming can be offset by adaptation and we believe that the economic and social returns from investing in adaptation should be properly weighed against the cost of mitigation (paragraph 27).

7. The issue of adaptation versus mitigation is clearly one of balance. Most adaptation expenditures would be local, while mitigation requires action on a global scale. Few would suggest doing nothing by way of mitigation, and few would suggest no adaptation expenditures at all. But the policy literature seems to us to be overly focussed on mitigation. We therefore urge the Government to ensure that greater efforts are made to understand the relative costs and benefits of adaptation compared to those of mitigation (paragraph 47).

The science of **measuring** impacts is far from speculative. Present day monitoring networks and phenological techniques have allowed us to monitor changes in the world around us as a result of changing weather patterns. Future impacts of climate change are undoubtedly more difficult to predict due to the sheer complexity of the impacts, their interactions with each other and the need to take account of the future socio-economic context. Future impacts on the natural world can be modelled using fundamental underlying physical principles, with the incorporation of as many of the feedback systems in the models as possible. Socio-economic impacts are more difficult to predict and need to take into account a range of largely unpredictable parameters (e.g. population and economic growth) through the use of socio-economic scenarios. Defra has commissioned research to improve the understanding of the impacts of climate change at both the global and local level and is actively encouraging the development of research in this complex area. Such work is required to underpin the development of adaptation strategies and the foregoing should indicate that the assessment of adaptation needs is a complex issue.

Adaptation alone will never be enough to tackle the predicted impacts of climate change. What is needed is a means to deal with the root cause of the problem, as well as addressing that damage to which we are already committed. This realisation is what motivates the Government's twin track approach. To continue to adapt in the face of rising emissions is a futile course of action. There are thresholds within the climate and physical systems, tipping points, that we must strive to avoid meeting and exceeding. Our "Avoiding Dangerous Climate Change" conference in February 2005 made this clear. The relative balance between adaptation and mitigation is a question of timing, as well as costs. Adaptation is principally used to address that change to which we are already committed, while mitigation is a longer-term course to avoid increasing further future damage. The costs of adaptation will increase as climate change becomes more severe.

Since 1997, the UK Government has supported the work of the UK Climate Impacts Programme. This has sought to support a stakeholder led approach to improved understanding of climate impacts and action on adaptation. The Programme has provided a range of tools for the assessment of adaptation options, including a risk uncertainty and decision-making framework for climate change

adaptation. As part of this work, during 2004, the Programme provided guidance on costing the impacts of climate change as well as on costing alternative adaptation options. This was produced as a set of CD-ROM tools as well as publications, and training workshops on the use of the methodology were held across the UK. The evaluation tool provides the means to carry out the types of assessments requested by the Committee. The work is in line with Treasury Green Book guidance.

The UK Government fully supports the use of cost benefit analysis to evaluate adaptation options. In making this methodology available we have enabled local decision makers the opportunity to appraise potential projects using a consistent cost benefit analysis framework.

Finally, an ongoing Defra-funded project will provide an improved estimate of the net costs that climate change will impose upon the UK through a number of key impacts. It will provide first estimates of gross sectoral costs of climate impacts at regional and national level over a number of future time periods and under a range of climate change and socio-economic scenarios. As far as possible, the costs of indicative adaptation measures will also be quantified, such that residual costs of climate change can be estimated. The project is expected to report in March 2006.

Response to paragraph 32 of the Report

8. We noted evidence from Professor Paul Reiter of the Institut Pasteur in Paris, which strongly disputed the IPCC's arguments on the likely spread of malaria as a result of warming (paragraph 32).

This is unconvincing. Professor Paul Reiter's evidence does not accurately represent the current scientific debate on the potential impacts of climate change on health in general, or malaria in particular. He appears to have been quite selective in the references and reports that he has criticised, focusing on those that are neither very recent nor reflective of the current state of knowledge, now or when they were published.

The IPCC's Third Assessment Report (2001) noted that malaria is caused by four distinct species of *Plasmodium* parasite, transmitted between individuals by mosquitoes. Malaria is undergoing a global resurgence because of a variety of factors, including socio-economic and policy changes, and variation in malaria transmission is also associated with changes in temperature, rainfall and humidity as well as the level of immunity. An estimated 40% of the total world population currently lives in areas with malaria. Other areas may become at risk as a result of climate change if, for example, malaria control programs have broken down or if transmission currently is limited mainly by temperature. The Report also indicated that there was currently insufficient scientific evidence to conclude that climate change was a cause of the reported increases in highland malaria in East Africa in the 1980-90s.

The effect of changes in climate on actual human disease will depend not only on the physical impact of climate change on potential disease transmission, but also on many social, economic and environmental factors that will vary between populations.

The distribution and seasonal transmission of malaria is affected by climate, as both mosquito and parasite are sensitive to temperature and water availability. Climate change *per se* would be expected to have the following effects on malaria (Kovats *et al.*, 2001):

- increase its distribution where it is currently limited by temperature—epidemic malaria may become present in new areas
- decrease its distribution where it becomes too dry for mosquitoes to be sufficiently abundant for transmission.
- increase or decrease the months of transmission in areas with “stable” malaria, some areas may change from unstable to stable malaria, and *vice versa*.
- increase the risk of localised outbreaks (that is, local transmission in areas where disease is eradicated but vectors are still present such as in Europe or the US).

All statements made by the IPCC in the assessment reports have been constructed very carefully. In this case, the reports have been very clear about the levels of confidence associated with each statement, about the difference between potential impacts of climate change on disease transmission and the actual human health impacts experienced, and about the importance of socio-economic and policy changes alongside climate change in determining future global incidence of malaria.

On human health effects generally, the IPCC stated that “overall, climate change is projected to increase threats to human health, particularly in lower income populations predominantly within tropical/subtropical countries” (Synthesis Report, 2001).

The accuracy and reliability of global malaria models, as well as the underlying science represented by such models, continue to improve, and the IPCC’s Fourth Assessment Report (due in 2007) will have a much larger number of published studies from which to draw conclusions.

Response to paragraph 37 of the Report

9. We draw attention to the fact that, if extreme events are indeed to be considered the most important impacts from climate change, there is uncertainty and controversy about the underlying data required to substantiate this claim (paragraph 37).

Extreme events, by definition, involve very substantial costs, as we have seen in recent natural catastrophes. It is therefore fully understandable that scientists and policy makers alike are keen to gain a better understanding of the impacts that climate change will have on the frequency or the nature of such events. On the other hand extreme events happen infrequently, and instrumental climate observational records are short, sparse or non-existent in many parts of the world. Hence there are uncertainties about whether or not frequencies or other characteristics of some types of extremes are changing; the IPCC tabulated what is known, and what is not, very clearly. Data requirements are specified in the action plan of the Global Climate Observing System; full implementation of this plan will contribute strongly to improving our understanding on how extremes are changing. The Hadley Centre is also developing further the treatment of extreme events in its climate models.

Response to paragraph 39 of the Report

10. How catastrophic threats such as disintegration of Antarctic ice caps should influence decision-making depends on the scale of the effects, their

probability of occurrence, and when they might occur. The scale of these events is clearly very large (paragraph 39).

Responding to low risk, large-impact events such as those listed is clearly a risk assessment exercise. The first stage is to quantify the likelihood of such events happening; the Defra research programme is used pro-actively for such work. For instance, it commissioned an assessment of the risk of collapse of the West Antarctic Ice Sheet, and the Hadley Centre research programme includes assessment of the weakening of the North Atlantic thermohaline circulation under future climates.

The continuous monitoring of the natural environment for signs of change, including the onset of major shifts in the climate system, is a vital contribution to risk assessment that deserves stronger support mechanisms than those currently in place.

At present many observations are made of the natural environment for a variety of reasons, e.g. for weather forecasting, and these are often useful for monitoring climate. However they do not provide all the information that is needed and it is now recognised that new monitoring systems are needed specifically for climate purposes. The piloting of the global observing system of ocean buoys (called Argo), initiated by the US and supported by the UK and many other nations through research funding, is a good example. The Global Environmental Change Committee (GECC) sub-group on Observations is tasked with reviewing and making recommendations on the UK's participation in and contribution to observational networks.

Response to paragraph 40 of the Report

11. If cataclysmic events which threaten the viability of existing societies are even remote possibilities, it is important that policy makers construct frameworks for analysing and debating probability and risks, since the threats associated with such “doomsday” scenarios are fundamental elements in driving the international discourse (paragraph 40).

The first step in analysing and debating probability and risk is to develop scientific understanding and gather information so that this can be done meaningfully. This has long been recognised, for instance it was the motivation for commissioning the study of the West Antarctic Ice Sheet referred to above (response to paragraph 39). It has also been recognised in IPCC circles; the Third Assessment Report (TAR) contains many quantified statements of the likelihood of the events it discusses. More recently there have been new methods developed to try to quantify more rigorously the uncertainties involved in climate, for instance the probabilistic prediction methodologies used by the Hadley Centre and by Oxford University in the project climateprediction.net.

Scientific evidence (notably the evidence reviewed by the IPCC) can then inform a public debate on probability and risks. This process is illustrated for example by the Government's response to the Royal Commission on Environmental Pollution report *Energy—the Changing Climate* (June 2000) and conclusions of the European Union Environment Council on levels of climate change to be avoided. The Government's work on the Social Cost of Carbon has also investigated the possibility of extending the economic framework to cover risks of this type, but it appears likely from this work that economic valuation will for the foreseeable future remain within the context of an assessment of physical risk.

Response to paragraph 41 of the Report

12. We think it important that the IPCC moves towards clearer judgements on the probabilities of the projected global temperature increases (paragraph 41).

The Government agrees that there could be benefits associated with moving towards probabilistic approaches to emissions projections, concentrations and temperature increases. The potential benefits of probabilistic approaches are currently being considered by the IPCC, and in a recent submission to the IPCC on emissions scenarios Defra has argued that “the IPCC should consider a wide range of scenarios and approaches to scenario building. This should range from the traditional “what if” approaches to more probabilistic approaches.”

The Hadley Centre (Murphy *et al.*) published a paper on this subject in Nature in 2004, and suggested other modelling centres might adopt their approach. Other climate modellers are now working on probabilistic predictions, so it is likely that they will feature in future IPCC assessments.

Response to paragraph 43 of the Report

13. We are clear that fuller consideration needs to be given to the literature on the positive effects of warming (paragraph 43).

The distribution of positive or negative effects of warming depends on geography/climate as well as on the impact sector. In some regions and in some sectors there are likely to be some initial benefits as well as costs associated to climate change. For instance the IPCC TAR showed that a global mean temperature increase of up to 1°C may be beneficial for some regions and sectors. On the other hand, our work during 2005 on climate change and Africa has identified the huge potential losses facing African nations as a result of expected climate impacts, and the challenge that any level of climate change poses to our collective ability to meet development goals. Apart from all this, any positive impacts of climate change are likely to be transient as the relative importance of negative impacts is likely to increase over time as temperature rises.

The key analytical issue is therefore to identify for each region/sector the expected changes (both positive and negative) and the level of warming at which negative impact prevail over positive impact (if indeed the sectoral/regional impact happen to be initially positive). This combined with scenarios of temperature increase can indicate the most likely timing of the switch between from positive to negative. The IPCC TAR observed that above 2°C of increase in Global mean Temperature (GMT) the vast majority of market impacts were predicted to be negative and most regions of the world would suffer adverse effects. A recent survey of impact studies for the Organisation for Economic Co-operation and Development (OECD) found that beyond 3 to 4°C of increase in GMT *all* impact study tend to show negative and increasing impacts. More recently, an expert review of the impacts literature presented at the Exeter conference (February 2005) showed that up to 1°C increase in global mean temperature is likely to be associated with damages in developing countries and with some benefits in developed countries, but beyond this point net damage is likely to increase in all areas. All these thresholds are well within the range of temperature increases for 2100 from the IPCC scenarios. Furthermore, recent probabilistic approaches to climate sensitivity (the degree of warming associated with a doubling of CO₂ concentrations above pre-industrial levels) have pointed to a much wider range

than the one used by the IPCC in its scenarios, particularly in relation to the probability of high values. In simple terms, the world may be warming much more quickly than previously thought, which means that any positive impacts of climate change may be more short-lived.

Work within the UK has identified potential benefits in the agriculture sector, due to lengthened growing season and altered temperature regimes, but such work also needs to take into account changing water resource availability and factors such as changing soil nutrient status. The 2005 Royal Society “Food crops in a changing climate” meeting identified that benefits previously identified as a result of carbon dioxide fertilisation are not as great as previously thought, as a result of large scale field experiments. Defra sponsored work is also underway on potential effects (both positive and negative) on tourism in the north-west of England. Finally, the ongoing research project on the costs of climate change in the UK mentioned in the response to paragraph 27 is aiming to assess costs net of any beneficial effects.

Response to paragraph 44 of the Report

14. We conclude that there are weaknesses in the way the scientific community, and the IPCC in particular, treats the impacts of climate change. We call for a more balanced approach and look to the Government to take an active role in securing that balance of research and appraisal (paragraph 44).

It is accepted that the science of impacts is a less mature subject than climate science and that methods and approaches are still being developed. Nevertheless major advances have been made since the Third Assessment Report as was apparent from the papers presented at the Exeter Conference on “Avoiding Dangerous Anthropogenic Climate Change”.

The UK does take a balanced approach to the costs and benefits of climate change and will continue to do so. Science must not be politicised. The UK Government strongly supports balance in the IPCC assessment process and has contributed to the development of the procedures which help ensure this.

Forecasting greenhouse emissions and temperature change

Response to paragraph 60 of the Report

15. Serious questions have been raised about the IPCC emissions scenarios, and a reappraisal of the scenarios exercise is urgently needed (paragraph 60).

IPCC’s emissions scenarios cover a very wide range and the most reasonable expectations about future outcome of global emissions in the absence of further mitigation action are likely to be included within the envelope. As already identified in responding to paragraph 2, the Government is well aware of the controversy that has been generated about these scenarios and notes that the authors responsible for them have responded in the literature, and that the IPCC is currently assessing these scenarios in the light of the literature now available.

While it is generally acknowledged that the nature of the questions raised on the IPCC scenarios do not alter the nature of the climate change policy debate, the Government agrees that the questions raised on the emission scenarios deserved serious and thorough attention. It is therefore with satisfaction that the Government observes that IPCC Working Group III (Mitigation of Climate

Change) is fully engaged with the debate on exchange rates and projections of economic growth, which has also been addressed by two recent workshops on scenarios. In the IPCC's Fourth Assessment Report (due in 2007), the IPCC will assess the scenarios published in the peer reviewed scientific literature, whether or not generated by IPCC. This will include consideration of the effect of revised population projections.

Overall, the Government strongly supports the continued strengthening and improvement of the economic assumptions feeding in the IPCC report and contributed significantly to IPCC's recent workshop on the requirements for future emissions scenarios.

Response to paragraph 63 of the Report

16. We consider the convergence assumptions in the IPCC scenarios to be open to some question. In our view, political factors should not be allowed to influence the scenarios, whether over the issue of convergence or indeed in any other context (paragraph 63).

Global modelling exercises, such as projecting world emissions of greenhouse gases require assumptions about economic convergence across regions. These convergence scenarios are often derived from exogenous assumptions on population and productivity growth which may be open to questioning. The dynamics of convergence are in themselves debated in the economic literature. Convergence is also conditional to political, institutional and geographical factors, and it is possible to witness clusters of very rapid economic growth in certain regions of the world (for instance the current rate of economic growth in China and in India) accompanied by stagnation in other regions.

It is therefore unsurprising that any set of assumptions is open to question, including the assumptions on convergence made for in the IPCC Scenarios, which also look at the very long-term. This does not imply political interference in the IPCC process and no evidence to suggest this has been provided.

The UK Government is providing support for a forthcoming workshop on the economics of convergence which is being organised by the OECD Environment Policy Committee in early 2006. It is envisaged that this event should help define a global baseline scenario, which could be used in global modelling exercises currently carried out in the OECD, other international institutions and academic research. The outcomes of this workshop could also provide a timely input for the ongoing IPCC Fourth Assessment Report.

Response to paragraph 66 of the Report

17. In general, any change in emissions due to changed economic assumptions will translate into a smaller effect on concentrations and an even smaller effect on temperature. This in no way excuses poor analysis in the emissions scenarios, but it may mean that projections of warming are not themselves greatly affected (paragraph 66).

Most commentators on the IPCC scenarios debate would agree that any change in emissions due to changed economic assumptions will translate into a smaller effect on concentrations and an even smaller effect on temperature, which does not respond in a linear manner to changes in greenhouse gas concentrations. In other words the current IPCC scenarios are still fit for informing the climate change policy debate.

Looking ahead, the Government believes that there may be scope for strengthening some of the analysis underpinning the IPCC socio-economic scenarios in line with developments in the literature. The Stern review will examine the effect of growth on energy demand and emissions.

Response to paragraph 68 of the Report

18. It appears that the IPCC scenarios are not capturing recent emissions experience in their short-term projections (paragraph 68).

This is incorrect. The Government's analysis of data from the International Energy Agency (IEA) and from the *BP Statistical Review of World Energy* suggests that since 2000 the percentage increases in global fossil carbon emissions are within the range of the values expected from the IPCC scenarios, and appear to be moving from about the centre of the range towards the top of the range. In the Government's view the Committee's analysis may have been unduly influenced by emissions reductions due to economic restructuring and fuel switching at the end of the last century and cannot be relied upon.

Response to paragraph 72 of the Report

19. We received a significant amount of evidence on the realism of the IPCC emission scenarios, and doubts were raised, particularly about the high emission scenarios. The balance of this evidence suggests to us that the high emissions scenarios contained some questionable assumptions and outcomes. While errors do not translate into equal magnitude errors in concentrations or warming, it seems to us important that the IPCC emissions modellers give serious attention to adopting the correct procedures (paragraph 72).

All scenarios are likely to contain assumptions that some will find questionable, and scenarios at the upper or lower end of a range may be questioned more than those at the centre. The IPCC has deliberately chosen a non-probabilistic approach. So the important point is the comprehensiveness of the range, not the "realism" of particular scenarios in the range.

As mentioned in responding to several of the recommendations made by this Committee, the Government supports the review of the literature on scenarios by the IPCC in its Fourth Assessment Report and—as mentioned in response to paragraph 41—sees the potential benefits of a move towards probabilistic scenarios

The costs of tackling climate change

Response to paragraph 73 of the Report

20. It is very important that a realistic picture of the likely costs be conveyed to, and understood by, people today who will have to pay them. We note the considerable efforts that the IPCC has made in constructing likely cost estimates for the world as a whole. We are far less satisfied with the data currently available on the costs to the UK, and we call for a significantly greater effort to clarify and estimate those costs (paragraph 73).

The Government agrees that the IPCC has made good progress in assessing global mitigation cost estimates and anticipates that further progress will be made with the IPCC's Fourth Assessment Report.

The Government agrees on the need for expanding and updating information on costs at the national level. The Energy White Paper (2003) set an international precedent by outlining economy wide costs of climate change policies. This covered abatement costs in absolute terms, as well as impacts on total GDP and GDP growth rates over the period to 2050 (estimated in a range between 0.5% and 2% of GDP for carbon reductions of 60%). The estimates were based on a wide range of sensitivities and scenarios. Sensitivities modelled included changing the availability of low carbon technologies and their costs, the cost and availability of energy efficiency in the domestic and business sectors and the level of innovation in low carbon technologies.

These estimates were found to be entirely consistent with those of other studies including by the IPCC.

The DTI and DEFRA have also commissioned additional academic work in this area to look at more recent studies of the impact of carbon abatement measures on GDP and have again found the numbers in the Energy White Paper to be within the range of estimates from these studies (see the ICEPT report (2005)).

While the costs to the wider economy appear to be relatively small, the Energy White Paper did not underestimate the challenges posed by the transition to a low-carbon economy. It acknowledged that transitional/adjustment costs may be high if tight reduction targets were adopted in too short a timescale; hence the need to use cost-effective instruments. The Energy White Paper also set as a key objective of UK's foreign policy securing international commitment to this ambition.

Information on the costs of specific policies and measures will be extended under the Climate Change Programme Review, currently under way. The costs and benefits of all the existing policies in the Climate Change Programme and all the possible new policies we are considering introducing are being calculated. We are using our best available data to assess each policy on a consistent basis in terms of tonnes of carbon it could save at what cost (including non-market costs). It is envisaged that the analytical work underpinning the review should produce abatement cost-curves showing the cost effectiveness and carbon saving potential of possible new policies and measures for reaching the Government 2010 goal of a 20% reduction in CO₂ and for being on a path towards the long-term targets. The work will also provide us with the opportunity to compare the carbon mitigation costs of our policies with the research evidence on the damage cost of carbon. Building on this work, the Stern review will provide an assessment of the economics of moving to a low-carbon global economy, including of the costs and benefits of adaptation, focussing on the medium to long-term perspective, and drawing out policy implications. This analysis will be applied to the specific case of the UK in the context of its existing climate change goals.

Response to paragraph 83 of the Report

21. Given the wide array of potential technologies, we are surprised that the Government's Energy White Paper should place such emphasis on just one technology, wind energy (paragraph 83).

This is incorrect. The Energy White Paper included analysis of a wide range of technologies aimed at abating carbon emissions in energy supply, energy demand

and the efficient use of energy and in the transport system. Therefore, stating that the Energy White Paper emphasises just one technology is a misrepresentation. Clearly, renewable energy is an integral part of the Government's long-term aim of reducing emissions by 60% by 2050. Achieving 10% of supply from renewables in 2010 would save approximately 2.5 MtC per year if the equivalent amount of energy were generated from gas. By 2020, 3-5MtC of carbon savings was indicated in the Energy White Paper as potentially coming from renewables. But this is only a share of the 15-25MtC of carbon savings that might be obtained in 2020. Also, the analysis underlying the Energy White Paper did not only look at wind among all generation technologies. The UK version of the Market Allocation model (MARKAL) which was employed in the analysis encompassed other low carbon generation sources such as biomass, wave and tidal, nuclear and carbon capture and storage as well as onshore and offshore wind.

Most importantly, current policies are not set up to favour any specific generation technology. In particular, the Renewables Obligation does not involve picking winners in order to meet the targets set for 2010 and 2015. Wind energy is, however, currently the most developed and cost effective of the renewable technologies with scope for expansion. It will play a major role in meeting the target of 10% of electricity to be supplied by renewables by 2010. An expansion of both onshore and offshore wind will be needed to meet this. 240 MW of wind generating plant has been built during 2004 (more than twice the 2003 figure), and around 600 MW is expected during 2005.

Response to paragraph 84 of the Report

22. In our view, it would be unwise to close the nuclear energy option. It is prudent to maintain as wide an energy portfolio as possible. We argue that the current capacity of nuclear power, before further decommissioning occurs, should be retained (paragraph 84).

Nuclear power is currently an important source of carbon free electricity and the Energy White Paper published in 2003 did not rule out the future use of nuclear energy. However, analysis for the White Paper showed that current economics make it an unattractive option. There are also important issues of nuclear waste to be resolved. The White Paper made it clear that the Government's priority is to strengthen the contribution that energy efficiency and renewable energy sources make towards meeting our carbon commitment. It therefore made no proposals to build new nuclear power stations but the possibility of new nuclear build at some point in the future is not ruled out.

The Prime Minister has recently announced that proposals on energy policy to tackle the combined threat of global warming and security of energy supply will be published in 2006, and this will include an assessment of all options, including nuclear. This will follow on from the ongoing review of the Climate Change Programme.

Response to paragraph 94 of the Report

23. We are concerned that UK energy and climate policy appears to rest on a very debatable model of the energy-economic system and on dubious assumptions about the costs of meeting the long run target of 60% reduction in CO₂ emissions. We call on DTI and the Treasury to improve substantially (a) the cost estimates being conveyed to the public and (b) the manner of their presentation. We believe that the Treasury should be more

active in scrutinising and publicising these costs and benefits, in association with Defra and DTI (paragraph 94).

The Government has taken care to ensure that cost information is thoroughly analysed and the risks in the calculations are fully understood. DTI and Defra have used a model (MARKAL) developed by the International Energy Agency (IEA) in order to derive the estimates of the costs of meeting the long-run target of a 60% reduction in CO₂ emissions by 2050. MARKAL is a widely used and tried modelling framework which has around 150 licensed users world-wide and has been applied in different variants in several countries including the US, the Netherlands, China and Japan. The IEA is currently engaged in a major study to look at available technologies for carbon reduction and their costs using a version of the MARKAL model.

But DTI and Defra have not relied on these estimates alone as noted in the response to paragraph 73 above. Both departments are currently examining the scope for upgrading the UK version of the MARKAL model to introduce more economic feedbacks and dynamics, which would help to address the concerns raised by the Committee.

The costs estimated for meeting the UK's 60% goal are consistent with expectations from the international literature and have been conveyed to the public via the Energy White Paper and the supporting documentation. The Treasury is fully involved with this work via the interdepartmental group responsible for the analytical work in this area.

The costs of any specific policy proposals are routinely and transparently presented to the public via the Regulatory Impact Assessment process, which provides a valuable mechanism for seeking views and challenging assumptions in the drafting of policy and cost implications. Consultation on regulatory impact assessments provides an opportunity for greater public scrutiny of the cost implications of Government policies.

The Stern review will also examine the cost implications of climate change. The Government is confident that this review will provide greater clarity on costs and help raise awareness of climate change impacts.

The benefits of climate change control

Response to paragraph 99 of the Report

24. Research suggests that, in terms of percentages of world GNP, monetised damage is relatively low, even for warming of 2.5°C. The damages are not evenly spread. In general, developing countries lose more than developed economies. Some models suggest no real net damage to rich countries (paragraph 99).

The Government agrees that the damages are often projected to be greater in developing countries which are the most vulnerable. This is clearly a matter of concern. It would be a mistake however to consider there would be little impact on rich countries. The Government notes that the range of monetised estimates available is very wide, and heavily dependent on assumptions made. Typically, benchmark estimates of the damage costs of climate change are not time-dependent, but rather are calculated looking at the impacts of a benchmark increase in temperature on the basis of current socio-economic scenarios. A higher rate of climate change (driven by a higher climate sensitivity to greenhouse gas

concentrations) would be likely to increase damage costs, also by reducing the possibilities for adaptation. Also, monetised estimates typically omit many physical impacts and risks and net damage estimates can conceal very significant losses to sectors of society and the economy. Finally the Government has already pointed the Committee to the transient nature of benefits from climate change in the response to paragraph 43.

Response to paragraph 101 of the Report

25. The evidence presented to us indicates that the estimates of monetised damage are highly controversial within IPCC deliberations (paragraph 101). We urge the Government to press the IPCC for a proper detailing of the estimates and for a discussion of the uncertainties in the next IPCC Assessment Report in 2007 (paragraph 101).

The Government is satisfied. The IPCC successfully assesses the scientific literature relevant to climate change (including not only the physical sciences but also the socio-economic literature) in a balanced and objective manner. It would be inappropriate for the UK or any other Government to press the IPCC on particular issues, and to do so would be to encourage political interference which the Committee elsewhere deplores. The Government agrees with the Committee that monetised damage estimates are often controversial and notes that this reflects differences in the socio-economic literature as well as the sensitivity to uncertain parameters such as the relationship between greenhouse gas concentrations and temperature increase.

Response to paragraph 105 of the Report

26. While we agree with others that the monetised benefit estimates for controlling global warming are uncertain, we are concerned that the IPCC appears to be playing down these estimates in favour of often detailed descriptions of individual impacts that cannot be brought into comparison with the likely costs of control. Perhaps one reason for this lack of emphasis is that the economic measures of damage give the impression that the benefits of warming control are smaller relative to the costs (paragraph 105).

The IPCC assesses the literature available to it, including the literature on monetised estimates and on physical impacts and risks. As discussed in responding to paragraphs 99 and 101 the Government notes that monetised estimates of the damage costs of climate change that are currently available are a subset of total damages and therefore inadequate by themselves as a basis for policy development. The only way that this will improve is by consideration of physical damage estimates not currently included in the models.

Response to paragraph 105 of the Report

27. We urge that explicit comparisons be made between the monetary cost of adaptation measures and their benefits. While we were reassured by Defra that they would be pressing for a higher profile for the economics in the IPCC's Fourth Assessment Report, we consider that the Treasury has a duty to reinforce Defra's intent. Indeed, given the potential importance of this issue, both in terms of public expenditure and of overall economic

cost, the Treasury should become directly involved itself, making its own economic assessment of the issue (paragraph 105).

Defra and other UK Government departments have commissioned or otherwise supported important research projects taking a longer term look at the economics of climate change and/or aimed at developing tools for economic analysis. Several of these activities have a good chance of being reflected in the IPCC Fourth Assessment Report.

As explained in the response to paragraph 27 and 47, the UK Government is committed to improving the evidence base on the costs and benefits of adaptation options in the UK. Nonetheless the Government recognises that there is further scope for investigating the monetary cost of adaptation measures and their benefits. The Stern review will examine the evidence on the economic, social and environmental costs and benefits of climate change, for both developed and developing countries, including the possibilities of increased climate volatility and major irreversible impacts. Evidence will also be collated on the climatic interaction of greenhouse gases with other air pollutants, together with the costs and benefits of actions taken to limit the damage.

The IPCC process

Response to paragraphs 111 and 114 of the Report

28. We can see no justification for an IPCC procedure which strikes us as opening the way for climate science and economics to be determined, at least in part, by political requirements rather than by the evidence. Sound science cannot emerge from an unsound process (paragraph 111).

29. The IPCC Summary for policy makers says that economic studies underestimate damage, whereas the chapter says the direction of the bias is not known (paragraph 114).

This is incorrect. The Government disagrees with the suggestion that the IPCC process is unsound and that it may lead to climate science and economics being determined by political requirements.

The agreement of Summaries for Policy Makers helps communicate IPCC outputs to Governments. Political bias is unlikely given the entire range of opinion represented by Governments who support the IPCC and the dialogue between the Government representatives and the IPCC authors. The process of agreement of Summaries for Policy Makers involves debate because of the level of engagement of Governments and authors. This is healthy and should not be mistaken for political influence and no evidence to the contrary has been provided.

The Government notes that the process of producing an Assessment Report is designed to be transparent and unbiased; IPCC members (governments) elect an IPCC Bureau of 30 members based on scientific credentials and also are asked to nominate scientists who may subsequently be chosen as contributors to the report. The Bureau then has responsibility for choosing authors and overseeing the production of an Assessment Report. IPCC members are not involved in this process. Authors are responsible for preparing the Report, including the Summary for Policy-makers. IPCC members subsequently consider and approve the Summary for Policy-makers, in part to ensure that the authors are not moving beyond their remit and producing a policy-prescriptive, rather than policy relevant while neutral summary.

The example given by the Committee is the only instance the Government has seen of an apparent discrepancy between an IPCC report chapter and the summary for policy makers. The Government recognises that the process of producing a summary for policy makers is difficult, as it inevitably involves some simplifications of the underlying scientific reports, and may lead to more emphasis being placed on the findings that are believed to be more politically relevant by Government representatives. Judgments may vary on how successfully this task has been carried out, and of course these judgments may themselves reflect the opinions of individuals; this tends to increase the value of Summaries for Policymakers as collective summaries rather than opinions of individuals or interest groups. The process of agreeing summaries is in any case open and consensual, so those delegates or authors who disagree with a particular sentence or paragraph have a chance to put forward alternative forms of wording.

Response to paragraph 116 of the Report

30. We are concerned that there may be political interference in the nomination of scientists to the IPCC. Nominees' credentials should rest solely with their scientific qualifications for the tasks involved (paragraph 116).

No evidence has been provided to justify these assertions. IPCC members elect three Working Group (WG) Bureaux, as part of the IPCC Bureau. Each WG bureau is comprised of two co-chairs and six members, and is responsible for producing a section of an IPCC Assessment Report. WG members are elected on the grounds of scientific expertise relevant to their part of the Report. Agreement of the Bureau is usually by consensus of the IPCC members. WG members are responsible for using their experience in the relevant research area to identify which authors should be invited to contribute to the Report. IPCC members (governments) are asked to nominate potential writers for a report, as noted above, but they are not involved in the identification of authors. In addition the Bureaux may also invite authors to take part who have not been nominated by IPCC members.

Response to paragraph 118 of the Report

31. The IPCC process could be improved by rethinking the role that government-nominated representatives play in the procedures, and by ensuring that the appointment of authors is above reproach. At the moment, it seems to us that the emissions scenarios are influenced by political considerations and, more broadly, that the economics input into the IPCC is in some danger of being sidelined. We call on the Government to make every effort to ensure that these risks are minimised (paragraph 118).

The Government disagrees with the view that emissions scenarios are politically determined. All government-nominated representatives (those serving on the IPCC Bureau) are agreed by consensus of the IPCC members, limiting any particular political influence of the composition of the Bureau from one or more Parties. The process by which authors are appointed is transparent. Appointments are the responsibility of the scientists in the Bureau, not the IPCC members. No basis has been provided to back up the assertion of political considerations.

UK policy and the international negotiations on climate change

Response to paragraph 122 of the Report

32. We note that the compliance mechanisms in the Kyoto Protocol are very weak and even counter-productive. We heard from several witnesses that the Kyoto targets themselves were going to make little difference to rates of warming (paragraph 122).

The Government is well aware that atmospheric greenhouse gas concentrations will not be stabilised in accordance with the United Nations Framework Convention on Climate Change unless the first commitment period under the Kyoto Protocol is followed by more comprehensive and ambitious commitments. UK policy is intended to help achieve this. This by no means diminishes the achievement of the Protocol. The Government notes that the Protocol and its compliance regime have facilitated the establishment of international trading in greenhouse gas emissions and have induced effects even amongst countries that have not ratified it. This means that the Protocol is likely to have a greater influence in limiting and reducing emissions than sometimes supposed.

The Kyoto compliance mechanism provides for several compliance consequences including the deduction from the Party's assigned amount for the second commitment period of a number of tonnes equal to 1.3 times the amount in tonnes of excess emissions. This is a significant penalty and could potentially have an impact on future negotiations, although we expect that negotiations on a future commitment period would be concluded at least by the end of 2012 and some two years before compliance assessment for the commitment period.

Another compliance consequence is the suspension of the eligibility to make international transfers. Kyoto envisages that targets will be met most cheaply by taking advantage of trading mechanisms and envisages compliance assessment as a comparison of unit holding of Kyoto units and final emissions. Following the completion of a review of 2012 emissions in 2015, parties will have 100 days—the additional period for fulfilling commitments—to purchase sufficient Kyoto units to bring them back into compliance, and to avoid the Kyoto penalty and potential suspension of trading eligibility. Suspension of eligibility to trade will reduce the opportunity to mitigate compliance costs in the middle of a future period and will generate its own incentive—i.e. should a Kyoto party fail to meet its targets it will prejudice its ability to meet targets in future periods.

In the EU context it should be noticed that additional compliance measures have been adopted under the monitoring mechanism and registries regulation. Member states are required to perform early compliance measures by retiring Kyoto units to cover Emissions Trading Scheme (ETS) emissions and national emissions on an annual basis from 2009. In addition from 2008 the suspension of Kyoto trading eligibility would also require suspension of EU ETS trading.

As has been observed by witnesses Kyoto represents only a first step in the reduction of emissions and that further reductions will be needed to impact on overall atmospheric concentrations of greenhouse gases in the atmosphere. The UK is open to innovative approaches to achieving the level of emissions and additional reductions necessary to avoid dangerous anthropogenic interference in the climate system, though we believe that targets, of whatever type, combined with emissions trading represents the most plausible and cost effective mitigation solution. A global emissions trading scheme is not an alternative to target setting. An approach based on technology deployment and development in the private

sector will require incentives, in which the creation of a global carbon price through trading has a major role to play. All market mechanisms including emissions trading will only work in conditions of scarcity and therefore only with the adoption of a clear cap on allowable emissions. We are surprised that the Committee is pessimistic on the prospects for improvement of trading compliance mechanisms—and in particular negotiation of trade sanctions—but more optimistic about the prospect of harmonising carbon taxes on an international basis, or on the introduction of global emissions trading without a cap on emissions which seems a fundamentally flawed position.

Response to paragraphs 123, 132, 133 and 136 of the Report

33. We consider that the “beyond Kyoto” negotiations, which start this year, will have to take a far more innovatory approach than simply assuming that the Kyoto targets will be tightened (paragraph 123).

34. The US has repeatedly stressed the role of technological change in securing greenhouse gas emission reductions. While the Kyoto Protocol should, in principle, encourage technological change, we are not convinced that it has sufficient focus on this central issue (paragraph 132).

35. We argue that the present “more of the same” approach, relying exclusively on targets for emissions reductions, may not tackle the global warming threat. We urge the Government to help broaden the debate through its membership and current presidency of the G8 and using its position of being internationally respected in the scientific world (paragraph 133).

36. It could be argued that it is late in the day to be suggesting a significant change of focus in the climate negotiations. But we fear that the “more of the same” approach, focusing on emissions targets, will fail (paragraph 136).

The UK and EU have begun deliberations on how we can build on action in 2008-2012 and accelerate the momentum to tackle climate change post-2012. We are keen to listen and learn from others’ views and perspectives, and engage in constructive dialogue to develop a common understanding of the global climate change challenge ahead of us, including what it implies for limiting global temperature increase and associated risks. The Kyoto Protocol first commitment period is only a first step in achieving emissions reductions, and it is clear from the science of climate change that considerably more needs to be achieved in the years after 2012.

The Government successfully raised the profile of climate change and facilitated debate by making the issue a G8 priority. The G8 agreed a plan of action at Gleneagles which addresses potential areas for collaboration in technology development as well as agreeing to work further on policy and market instruments to reduce emissions. The Government sees these activities as complementary to the United Nation’s Framework Convention of Climate Change (UNFCCC) and the Kyoto Protocol, which already contain provisions for technology transfer and capacity building in developing countries as well as the Clean Development Mechanism to encourage investment in energy and carbon saving.

The Government looks forward to international discussions on the widest possible range of options for building on the achievements of the UNFCCC and Kyoto Protocol.

*Response to paragraph 137 of the Report***37. Climate adaptation should become one of the mainstream elements of investment decisions, particularly with respect to infrastructure, housing, coastal development and international development assistance (paragraph 137).**

Although it doesn't make sense to ignore the cause and just deal with effects, we agree we must address this, and have been working to secure this for some time. Domestically, climate change is now a material consideration in the planning process (PPS1² and PPG25³), is being incorporated into building regulations (Part L), codes of practice (including those of the Chartered Institution of Building Services Engineers and the Construction Industry Research and Information Association) and allowances are made for climate change in planning flood and coastal defences (Making Space for Water⁴). The Department for Transport (DfT) is also looking at adaptation to climate change in the transport sector. The Department produced a report in April 2004 which looked at the impact of climate change on transport⁵, and the recommendations in that report are being implemented. For example, workshops have been held to look at climate risks and possible adaptation actions for the road and rail sectors; a website to pool transport adaptation research has been set up (www.dft.gov.uk/strategy/climatechangeimpacts); and the Department is about to go out to tender on a contract to produce best practice guidance for local highways authorities on how climate change will affect their maintenance operations.

There are many more examples of climate change adaptation considerations being mainstreamed into investment decision-making. Guidance is being made available to investors by groups such as the Institutional Investors Group on Climate Change, and the University Superannuation Scheme to guide investment decision-making.

Internationally, our work during the UK's presidency of G8 has identified the need for climate change to become a more prominent consideration in bilateral and multilateral overseas development spending. In the Gleneagles plan of action the G8 leaders called on the World Bank to incorporate climate risk screening into development aid decision for those investing in climate sensitive sectors. Other multilateral and bilateral development organisations were also invited to adopt the World Bank guidelines. This will raise the profile of adaptation in development planning, and ensure the long-term sustainability and resilience of the agencies development efforts. It will also play an essential role in decreasing recipients' future vulnerability by enhancing the return of development investments at effectively no cost. The Department for International Development (DFID) have been progressing this work with the Bank.

DFID India Trust Fund is funding a study by the World Bank addressing vulnerability to climate variability and climate change in India through an assessment of adaptation issues and options. Outcomes sought include a common understanding of issues and options for an informed dialogue between and within

² <http://www.odpm.gov.uk/index.asp?id=1143805>

³ <http://www.odpm.gov.uk/index.asp?id=1144113>

⁴ <http://www.defra.gov.uk/environ/fcd/policy/strategy.htm>

⁵ DfT, April 2004, *The Impacts of Climate Change on the Transport Network*, http://www.dft.gov.uk/stellent/groups/dft_about/documents/page/dft_about_032280.hcsp

the Bank and the Government of India and better integration and mainstreaming of climate issues into the Bank's activities and into India's development efforts.

DFID Bangladesh is focusing on the integration of long-term climate risks and uncertainties and consequent adaptation and disaster risk reduction as an integral part of national development planning through the Poverty Reduction Strategy Paper and the Medium Term Policy Framework. A framework for assessing and managing climate change and disaster risks is also being applied across the DFID Bangladesh programme portfolio. In addition, £6 million have been provided over five years to establish a Comprehensive Disaster Management Programme to enable the transition of disaster management from relief to a risk reduction focus, including longer-term climate risks. Support is also being provided to build internal government capacity in Bangladesh to coordinate and integrate climate change issues in mainstream development activities and across government with a focus on awareness raising, advocacy and coordination to promote climate change adaptation and risk reduction in development activities.

The Commission for Africa report also highlighted the need to screen new investments in infrastructure for their potential impact on the environment, and for the potential impact of the environment (climate variability and change) on the sustainability of the investments. In the latter case, the report points to the need for mainstreaming climate responses into project planning and design. An ex ante climate-risk screening tool is an effective means to that end.

Response to paragraph 140 of the Report

38. We urge a thorough review of the Climate Change Levy regime, with the aim of moving as fast as possible to replacing it by a carbon tax (paragraph 140).

The Government has published a review of the Climate Change Levy (CCL) by Cambridge Econometrics in March 2005 which suggested that the levy is expected to deliver over 3.5 million tonnes of carbon by 2010. The CCL is a "downstream" energy tax, levied by utilities at a relatively late stage in the distribution chain, in order to avoid taxing the domestic sector. Because it is a downstream tax, it is difficult to differentiate between fuels used for electricity generation. Any tax that did so could impact on the domestic sector.

Response to paragraph 141 of the Report

39. There appears to be growing support for the idea that Kyoto-plus should focus on technology and R&D (paragraph 141).

We refer to response to paragraphs 123, 132, 133 and 136.

The Government looks forward to international discussions on the widest possible range of options for building on the achievements of the UNFCCC and Kyoto Protocol. Large-scale investment in technology in isolation is a risky strategy that will not deliver for many years and is unlikely to ever lead to sufficient reductions in emissions. Technologies developed by R&D need incentives to pull them into the market and make them cost effective. Furthermore, governments are better at creating an environment in which people have an incentive to innovate than in picking winners. We are surprised by an Economics Affairs Committee's lack of faith in market solutions to provide such incentives when the evidence is they are having a positive effect on encouraging new technologies.

Response to paragraph 142 of the Report

40. The International Energy Agency has estimated that the R&D expenditure needed, if carbon-free energy is to become economically viable through the use of solar photovoltaics, biomass and carbon sequestration, is around \$400 billion. The IEA programme would cost about the same now as the 1963-73 US Apollo programme that put man on the moon cost then—1% of world GNP. Such an R&D programme would be a true global public good: one in which everyone would have a share of the benefits. This is an illustration of what international negotiators might now consider—an agreement on technology and its diffusion (paragraph 142).

The international community collaborates on R&D through a number of fora. The G8 agreed in their plan of action, to further their support for existing research networks into major technologies that have the potential to deliver reductions of the order necessary and to seek ways to improve the current arrangements for collaboration between developed and developing countries.

The IEA's Implementing Agreement system is another way to get better value for money spent on R&D through international cooperation. More than 40 Implementing Agreements have been put in place to cover a range of technologies in which member countries collaborate including energy efficiency, renewables, clean coal in power generation, carbon capture and storage, hydrogen and fusion. Non-member countries and private businesses are now being encouraged to join these agreements.

Whilst R&D can reduce costs this may not be sufficient to encourage adoption in a free market. This is because of the failure of the market to fully value the abatement of CO₂ emissions as a primary objective. For example, carbon sequestered energy generation will always be more expensive than generation without it so there will always be a need to create incentives to shift to low-carbon options.

Response to paragraph 143 of the Report

41. The important issue is to wean the international negotiators away from excessive reliance on the “targets and penalties” approach embodied in Kyoto. Hence there should be urgent progress towards thinking about wholly different, and more promising, approaches based on a careful analysis of the incentives that countries have to agree to any measures adopted (paragraph 143).

The Government believes that the important issue is to strengthen implementation of wide-ranging UNFCCC in ways that meets its overall objective to achieve stabilisation of greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous anthropogenic interference with the climate system. As explained in response to paragraph 122, targets have an important role to play in driving emissions reductions and are essential to cost effective solutions such as cap and trade systems. But the Government also believes that we should explore options for broadening the range of actions open to countries and that devising incentives for strengthening action could be a very important part of broadening participation in global action.

Department for Environment, Food and Rural Affairs

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