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*From the Treasurer and Vice-President Sir Eric Ash CBE FEng FRS*  
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## **Response to Environmental Audit Committee's Inquiry into Renewable Energy**

### *Overview*

In August 2000 the Royal Society and the Royal Academy of Engineering established a working group, of which I was Chair, to assess the role of European renewable energy policy in reducing anthropogenic emissions of greenhouse gases. This study was prompted in part by the European Commission's (EC) proposed Directive on the promotion of electricity from renewable energy sources in the internal electricity market (RES-E Directive). The working group considered information provided by over forty individuals and organisations with expertise in energy policy issues. Of particular relevance to your inquiry, we attempted to assess the UK's ability to meet the 10% target for the generation of electricity from renewable sources by 2010 proposed by both the UK government and in the draft EC RES-E Directive. We considered both economic factors, such as the impact of the new Renewables Obligation, and implementation barriers, such as planning requirements and the scale of build. However, it was clear that much could be achieved if appropriate economic instruments were in place. I have summarised the key findings of our study in the sections below. Further details are provided in our final report *The role of the Renewables Directive in meeting Kyoto targets*, which I have enclosed<sup>1</sup>.

### *Importance of renewable energy*

Our report focused on the role of renewable energy in reducing the emissions of greenhouse gases and thus meeting the UK and European Union's Kyoto commitments. The importance of achieving such reductions has been highlighted by the recent report from the Intergovernmental

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<sup>1</sup> *The Role of the Renewables Directive in meeting Kyoto targets* Royal Society and The Royal Academy of Engineering, October 2000. Available from the Royal Society at the address above or <http://www.royalsoc.ac.uk/policy/reports.htm>

Panel on Climate Change<sup>2</sup> that suggests that global surface temperatures could rise by up to 5.8°C by 2100 and which finds increasing evidence for a human influence on global climate. On this trajectory the environmental impacts could prove to be extremely serious well before the middle of the century.

Renewable energy sources have the advantage of either not emitting greenhouse gases (e.g. wind, solar, tidal) or being essentially greenhouse gas neutral (e.g. biomass crops that emit no more carbon dioxide in the electricity generating process than they have absorbed during their growth). In addition, renewable energy can have a role in increasing security of supply and can provide an important contribution to sustainable development as reserves of fossil fuels decrease. Although beyond the scope of your enquiry it is perhaps worth adding that these advantages apply also to nuclear energy – a topic on which we reported in June 1999<sup>3</sup>.

#### *Impact of recent government reforms*

Our study concluded that **the introduction of the correct economic instruments is the single most important factor controlling the sustainable growth of renewable technology**. There is widespread concern that the economic instruments that are currently proposed in the UK will prevent the renewables industry from developing at the rate necessary to reach the Government's 10% target. Under the new Renewables Obligation (incorporated in the Utilities Act 2000) and associated Renewables (Scotland) Obligation, electricity suppliers will have to supply a proportion of their electricity from renewable sources or purchase the equivalent number of 'green certificates' from others who have supplied power from renewable sources. However, suppliers who are unable or do not wish to provide the required proportion of electricity from renewables can 'buy-out' their obligation, essentially pay a fine. The level of this buy-out price is critical, as it will set the maximum market price for renewables. At the time of our report indications were that it will be set at 3 pence per kilowatt hour (p/kWh). This is judged to be too low to encourage the more expensive technologies such as offshore wind that will almost certainly be necessary to meet the UK's 10% target. In contrast, the non-fossil fuel obligation (NFFO) previously employed in the UK operated a banded pricing scheme to reflect the different costs of the various technologies. NFFO also provided contracts of up to 15 years, a factor that offered a level of security to potential investors. In this respect therefore recent government reforms appear to have reduced the incentive for embarking on the more expensive technologies.

The situation for the renewable industry in the UK is further complicated by the New Electricity Trading Arrangements. It would appear to discourage some renewable energy schemes (wind tide, solar) as a consequence of their variability of supply and thus their inability to guarantee to supply a contracted amount of electricity within the specified period.

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<sup>2</sup> *Climate Change 2001: The Scientific Basis*. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change. In press.

<sup>3</sup> *Nuclear energy - the future climate*. Royal Society and The Royal Academy of Engineering, June 1999. Available from the Royal Society at the address above or <http://www.royalsoc.ac.uk/policy/reports.htm>

The primary aim of any economic measures should be the reduction of greenhouse gas emissions. The most direct economic approach is to introduce a cost for such emission, namely a tax on the quantity of carbon emitted – an upstream carbon tax on primary fuels. In fact the current framework of UK economic instruments which includes the Renewables Obligation, the Climate Change Levy ( a tax on energy usage irrespective of whether it has involved the emission of greenhouse gases) and some complex rules on what is eligible as a “renewable” source<sup>4</sup>, amount to an attempt to micromanage complex aspects of the whole economy. One can understand how these economic instruments have evolved, but the prospects of success are no better than associated with other attempts to introduce a command economy. A carbon tax cuts through this complexity; it has a direct impact on what needs to be controlled – the emission of greenhouse gases. It is the approach which has been recommended by almost every group that has studied these issues – most recently the Royal Commission on Environmental Pollution<sup>5</sup>.

The key problem with economic instruments – and the carbon tax is no exception – is that it is exceedingly difficult to implement in a single country. We have seen how differences in the price of diesel between ourselves and France can cause enormous social stresses. Whilst there is no environmental reason for general tax harmonisation, we regard the convergence to international agreements on economic instruments designed to reduce carbon emission as absolutely essential. It is important to appreciate that the level of carbon tax needed to encourage a number of renewable technologies is not enormous. As also demonstrated in a recent DTI report<sup>6</sup>, a tax equivalent to one penny per kilowatt hour would provide a very considerable incentive.

### *Planning regulations*

Information provided to our working group suggested that planning regulations are a major barrier to new wind energy generators – probably the most promising of the renewables in the immediate future. There is evidence that the information available to planning committees is not always up to date. In the case of wind farms noise and visual intrusion are often cited as reasons for denying permission. Technology has progressed and can now mitigate much of the objection on the count of noise. We would welcome any initiatives that promote a better understanding of all the issues pertaining to renewable energy generation among the wider community.

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<sup>4</sup> For example, under DTI's most recent proposals a 9 MW hydroelectric installation will be eligible under the Obligation but a 11 MW one will not!

<sup>5</sup> *Energy – the changing climate*. Royal Commission on Environmental Pollution, Twenty-second report, Cm 4749, June 2000.

<sup>6</sup> *New and renewable energy – prospects for the 21<sup>st</sup> century*, (DTI/Pub 4024/3k/3/99/NP URN 99/744), March 1999.

### *Research and Development*

Sufficient levels of funding of research and development are crucial in ensuring sustained growth of renewable technology, with the correct balance depending on the technology in question. Wind turbines, for example, no longer require core research funding but do require investment in development to reduce manufacturing, production and installation costs. They also need funding for demonstrators for large off-shore installations<sup>7</sup>. Our report recommended that investment in this area be increased. We also stressed the importance of using the results from energy R&D programmes to inform the development of government policies in this area. There are examples of this practice within the European Commission<sup>8</sup>.

### *Other potential barriers to the growth of renewables*

In addition to the barriers presented by economic factors and authorisation procedures, issues of scale of build and integration into the grid should also be considered.

Our working group was concerned that the sheer scale of the implementation required will place a significant strain on the engineering and manufacturing industry. In order to meet the 10% target a significant change in the rate of building and commissioning renewable energy installations is required. With current technology and available equipment, respondents assumed that most of the UK's indicative target would have to be met by increasing the amount of wind generation. The scale of generation needed (in the order of 39-44 TWh per year by 2010) would require the construction and installation of between 3,000 and 5,000 new wind turbines over the next 10 years (in excess of 1 per day). It is possible that, given economic viability, industry could meet this manufacturing challenge. However there must be some doubts as to whether the planning and sociological issues would allow this rate of development.

Integration into the UK's national grid has been a potential obstacle for many renewable generators. We recognised that the geographical areas which offer the most potential for renewables are often remote from suitable grid connection points. Additionally, many are in the north of the country where connection will imply additional costs - adding to the already significant North-South movement of power. Whilst granting priority access (as advocated in the draft EC RES-E Directive) can ameliorate this disincentive, it is unclear who will fund the requisite upgrade of the distribution systems. While we were reassured by a number of respondents that the distribution systems can cope with at least 10% of renewable generation (including variable sources), there were concerns that the quality of supply may decline in terms of the stability of the frequency and the presence of harmonics.

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<sup>7</sup> I therefore welcome the opening of the UK's first offshore wind farm at Blyth Harbour.

<sup>8</sup> For example, the output of programmes funded by the EC ALTENER programme were used in the development of the RES-E Directive.

*Validity of percentage targets:*

Finally, our working group felt that the reliance on targets expressed as a percentage of the total electricity consumed is flawed; it is not a direct measure of the success which attends our efforts to reduce carbon dioxide (CO<sub>2</sub>) emissions. The Kyoto Protocol uses 1990 emissions figures, quoting an equivalent mass of CO<sub>2</sub> as a baseline. However the reduction of CO<sub>2</sub> emitted by generating a percentage of electricity from renewable sources will depend on the total demand for electricity and on the origin of the electricity. For example, a requirement for 10% electricity from renewable sources in a scenario of increasing electricity supply would leave 90% of the increase being supplied from other sources and thus the potential for an increase in emissions to the environment. In the UK, at least, electricity demand is still rising<sup>9</sup>. Similarly, a reduction in the electricity supplied from non-CO<sub>2</sub> emitting sources, such as nuclear power, and its replacement with electricity supplied from renewable sources would result in no net change in emissions. In our report we recommend that targets be set in terms of a maximum mass of CO<sub>2</sub> emitted from electricity generation would be more appropriate.

We would be glad to enlarge on some of these issues in giving oral evidence, should the Committee find this to be helpful.

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<sup>9</sup> *Digest of United Kingdom Energy Statistics*. Department of Trade and Industry 2000.