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Carbon Capture and Storage

Institute of Physics, Royal Society of Chemistry and Institute of Biology response to an Environmental Audit Committee Inquiry

2 June 2008

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Sara Howe
Environmental Audit Committee
Room 118/119
7 Millbank
House of Commons
London SW1P 3JA

IOP Institute of Physics

Dear Ms Howe

Carbon Capture and Storage

The Institute of Physics, the Institute of Biology and the Royal Society of Chemistry welcome the opportunity to respond jointly to the Environmental Audit Committee inquiry on Carbon Capture and Storage.

The attached annex and supporting documentation highlight the concerns of the three organisations.

If you need any further information on the points raised, please do not hesitate to contact me.

Yours sincerely

Rosie Davies
Accreditation and Policy Coordinator
The Institute of Physics

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Carbon Capture and Storage

1. The following items of background information about carbon capture and storage (CCS) are attached:

    - The report of a seminar on CCS organised jointly by the three societies in December 2007
    - The RSC's position statement on CCS
    - An unpublished draft of a report on carbon emission reduction in electricity supply, commissioned by the IOP. This report includes a chapter on CCS as well as other chapters relevant to the current situation, covering topics such as supercritical plants and combined heat and power (CHP).

2. It is very important that CCS is developed as a part of a portfolio of measures to stabilise greenhouse gas concentration in the atmosphere. Globally, the supply of primary energy will continue to be dominated by fossil fuels until at least the middle of this century; both due to existing and newly built power stations. The UK and other Western countries are in a position to develop CCS technologies to be transferred, when mature and cost-effective, to countries such as China and India as a retrofit option on some of their plants, which otherwise will be locking us into emissions of CO_2 for decades to come.

3. The very long-term environmental viability of CCS may not be substantial compared to similar-scale efforts in other areas such as energy efficiency and renewables. However, it is the only method of reducing the climate change impact of fossil fuels which continue to be used, so represents an essential medium-term measure. Most least-cost scenarios for the stabilisation of greenhouse gas concentration in the atmosphere in the range of 450-750 ppmv CO_2, show that CCS could contribute between 15% and 55% of the cumulative effort to reduce the greenhouse gas emissions globally until 2100.

4. All of the sources listed in paragraph one outline details of the three technological methods of carbon capture: pre-combustion, post-combustion and oxyfuel. Factors such as the concentration of CO_2 in the gas stream, the pressure of the gas stream and the fuel type (solid or gas) are important in selecting the appropriate capture system. Post-combustion approaches are required if carbon capture is to be retrofitted onto existing power plants. Other approaches, including oxyfuel or alternative solutions using algae, can be used to capture distributed CO_2, independent of a large point emission source.

5. The current BERR CCS demonstration competition[1] is limited to post-combustion technology. While this initiative may be effective in achieving the first facilities to retrofit to existing power stations, it is not sufficient to incentivise the longer-term

[1] www.berr.gov.uk/energy/sources/sustainable/carbon-abatement-tech/ccs-demo/page40961.html

development of power plants built with integral carbon capture, or to support the broader development of CCS. Even within the post-combustion approach, the choice to limit the competition to only a single demonstration is also very restrictive, and not the most effective way to ensure the technology reached its potential. Currently the CCS sector faces a steep learning curve, and government financial support should be provided for CCS in a way which does not pre-judge what the best technical approaches are going to be.

6. The cost of CCS will favour highly-efficient power plants. CCS increases the cost of generating electricity by 12-60% depending on energy prices[2]. It is forecast that, in the next decade, the cost for capture will be reduced by at least 20-30%, and the costs of transport and storage will also decrease as technologies become more mature. Modelling indicates that CCS may be deployed in electricity generation if CO_2 abatement prices reach £11- £15/(t CO_2).

7. A power plant with CCS using geological storage requires an associated energy consumption of around 10-40% of its output. It will be vital to monitor this and improve efficiencies.

8. Compared to new build power stations including CCS, the retrofit of CCS to existing power plants would increase costs and significantly reduce generating efficiencies.

9. In order for CCS to become an economically sustainable part of the energy market, various challenges must be overcome. Not only will significantly improved CCS technologies be required, but also a sufficiently competitive and relatively stable price for carbon under the EU Emissions Trading Scheme; a framework which treats CCS as a low carbon technology, recognizing that a plant using CCS produces CO_2 without releasing it into atmosphere; and a legal framework to deal with issues such as sub-sea sequestration.

10. CCS is not the only factor to consider in terms of the environmental impact of a new fossil-fuelled power plant. New plants operate at significantly higher efficiencies, and flue gas desulphurisation is now mandatory. Some background on the development of supercritical plants is given in the draft report listed in paragraph one. It is worth emphasising that CHP is by far the most efficient way to use fossil fuels, with efficiencies of up to 80%. CHP can be based on a variety of technologies including gas turbines, steam turbines, reciprocating engines and CCGT. It can also be used in combination with CCS.

[2] IPCC Special Report Carbon Dioxide Capture and Storage, Summary for Policymakers, A Special Report of Working Group III of the Intergovernmental Panel on Climate Change, 2005

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The Royal Society of Chemistry is the largest organisation in Europe for the advancement of the chemical sciences. Supported by a network of over 43,000 members worldwide and an internationally acclaimed publishing business, our activities span education, training, conferences and science policy and the promotion of the chemical sciences to the public.

The Institute of Biology is the professional body for UK biologists. Its members work in industry, research, education and healthcare, amongst other areas. It was founded in 1950, obtained a Royal Charter in 1979, and is a registered charity with over 13,000 individual members as well as learned Affiliated Societies covering every area of the biosciences.

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