Our Ref: CG/JM/JA/JW/ ORG13-A1829
Your Ref: -

Katherine Mansfield
Environment and Transport Taxes
HM Treasury
1 Horse Guards Road
London SW1A 2HQ

11 May 2006

Dear Ms Mansfield

CARBON CAPTURE AND STORAGE: A CONSULTATION ON BARRIERS TO COMMERCIAL DEPLOYMENT

Thank you for providing the Scottish Environment Protection Agency (SEPA) with the opportunity to comment on the above consultation document.

On an international basis it is clear that to meet global energy demand, fossil fuel powered devices are likely to be used for at least 50 years. To ensure that this does not continue to drive climate change, the concept of carbon capture and deep geological storage (CCS) has been proposed. Reducing the amount of CO_2 released into the atmosphere is vital in tackling climate change, and consequently the 2003 Energy White Paper[1] sets the target of a 60% reduction in UK emissions of CO_2 by 2050. However, working on the presumption that it is accepted and can be shown to work effectively, the contribution CCS technology can make to this must be considered in context. CCS could have a major impact in reducing carbon dioxide from large stationary sources, particularly power stations. However, it comes at a significant efficiency penalty and does nothing about carbon dioxide releases such as transport and domestic sources. CCS could be viewed as a quick-fix solution that may not achieve long term reductions in CO_2.

The consultation document highlights five sections of issues in relation to CCS. These are: potential carbon reductions; technology; engineering and manufacturing capability; regulation, liability and public acceptance; and cost. SEPA's views on each section are set out in the attached Annex.

As a public body committed to openness and transparency, SEPA feels it is appropriate that this response be placed on the public record. If you require further clarification on any aspect of this correspondence, please contact Jane Allan, Unit Manager (Air Policy), in the first instance at the address shown below.

Yours sincerely

Campbell Gemmell
Chief Executive

Enc

[1] DTI White Paper, Our Energy Future, Feb 2003

ANNEX

CARBON CAPTURE AND STORAGE: A CONSULTATION ON BARRIERS TO COMMERCIAL DEPLOYMENT

Potential carbon reductions

This issue has been outlined on the previous page. A recent report from the International Energy Agency[2] (IEA) concluded that CCS could contribute to reductions of between 60 and 600 Gte of CO_2 (expressed as carbon).

CCS must ensure that suitable storage is secure over a significant time frame, likely to be of thousands of years. Sourcing areas of suitable geological formation and ensuring public acceptance are important aspects in relation to secure storage. SEPA would argue that the risks associated with the storage of CO_2 and the timescales required for its safe disposal (decay) are probably less than those associated with high level radioactive waste.

Technology

CCS is technically possible as all three stages of the process (capture, transport and storage) are being carried out commercially today, but the integration and scale up needed for routine application will require further research and demonstration.

The IEA report gave a useful technology summary of where the various elements of CCS sat in terms of being at the research scale, demonstration scale, mature technology, etc. This is reproduced below. There is greatest uncertainty with the storage side.

Current State of Technological Development of CCS System Components
(the X's indicate the highest level of maturity for each component)

CCS Component	CCS Technology	Research Phase	Demonstration Phase	Economically Feasible under Specific Conditions	Mature Market
Capture	Post Combustion			X	
	Pre-Combustion			X	
	Oxyfuel Combustion		X		
	Industrial Separation (natural gas processing, ammonia production)				X
Transportation	Pipeline				X
	Shipping			X	
Geological Storage	Enhanced Oil Recovery (EOR)				X*
	Gas or Oilfields			X	
	Saline Formations			X	
	Enhanced Coalbed Methane Recovery (ECBM)		X		
Ocean Storage	Direct Injection (dissolution type)	X			
	Direct Injection (lake type)	X			
Mineral Carbonation	Natural Silicate Minerals	X			
	Waste Materials		X		
Industrial Uses of CO_2					X

*CO_2 injection for EOR is a mature market technology, but when used for CO_2 storage it is only "economically feasible under specific conditions".

Source: IPCC

[2] IEA, Prospects for CO_2 Capture and Storage, 2004

The recent Large Combustion Plant BREF note tackles reductions in CO_2 in terms of generating efficiency. There is a brief mention of CCS but this is seen very much as an emerging technology.

Plans for new generation plant should be designed "capture ready" and with sufficient land to build the appropriate plant, in order to benefit from CCS when, and if, this technology can be routinely applied to large-scale plants.

Early adoption of CCS technology could catapult the UK as the market leader for this type of technology, with the potential for the associated economic and social, as well as environmental, benefits. CCS, when used for enhanced oil recovery (EOR), can potentially increase oil and gas production, which would consequently improve the security of the UK's energy supply.

There are a range of technologies that could be used in each of the three stages of CCS. Careful consideration will be needed to ensure the most appropriate technologies and techniques are utilised. For example, some pilot projects are based on the production of hydrogen from natural gas and subsequent transport and storage of the CO_2. There remains some concern over the overall energy balance for this; considerable energy is required to produce the hydrogen from the natural gas. In other words, the amount of electrical energy produced would be much less than that produced by the combustion of natural gas alone.

Following on from this, on other forms of CCS such as oxyfuel and post combustion capture, these concerns would extend to the reduction in fuel efficiency. It is the compression step which is very energy intensive. In other words, CCS is feasible but for a given electrical output you need much more fuel.

Engineering and manufacturing capability

The UK, and particularly Scotland, is well placed to develop and exploit this technology due to our historic experiences in deep coal mining and North Sea oil exploration. The geological formations under the North Sea are well known.

As a result of this, sites like Peterhead would be a good place in which to develop a CCS Power Station such as the proposed DF1 plant. However, the system of access charges means electricity generated here incurs a significant cost penalty compared to a power station in the South East of England. This is something which central Government, through Ofgem, could address. Significantly, there are limits to the amount of electricity that could be generated in the Peterhead area from new power stations as there is a constraint within the current National Grid. There may be a need for development of the grid infrastructure if CCS takes off.

In addition, a recent report from the House of Commons Science and Technology Committee[3] highlighted a number of key points about the long term storage of carbon dioxide in the North Sea. These included that there is a finite opportunity to reuse the existing pipe work infrastructure in the North Sea for CCS projects as the production of oil and gas tails off.

Regulation, liability and public acceptance

Within this section, SEPA will include comments on the potential environmental consequences. Although it is noted that environmental and safety issues are not specifically mentioned in the consultation document.

---

[3] The Stationery Office Ltd, House of Commons Science and Technology Committee, Meeting UK Energy and Climate Needs: The Role of Carbon Capture and Storage Volume I, Feb 2006

With regard to regulation aspects, SEPA's understanding is that the current legal framework, both at an international and domestic level, would prohibit CCS. This legal barrier could be the biggest hindrance to the large-scale development of CCS. Solutions need to be found (which are likely to include amendments to international treaties), but given the comment above about finite opportunity, there may not be sufficient time to put in place the correct legal framework.

CO_2 emissions from large combustion plant are captured within the European Union Emissions Trading Scheme (EU ETS). CCS projects linked to any plant that is in the EU ETS must therefore be included within this scheme to provide incentives but also to cover any loss of CO_2 due to process or leakage.

With regard to liability and public acceptance, the following points should be noted:

- Acidic nature of the gas creates transportation problems and potential to acidify aquifers/groundwater;
- Coal seems may not be a viable store as chemical reaction between the coal and CO_2 may hinder storage and more work is needed in this area;
- Liability for capture, transport and initial storage must be the responsibility of the operator. Government may need to look at taking on long term liability of storage;
- CCS increases running costs and decreases efficiencies; and
- Public concerns will centre on leakages from underground storage, and ensuring the public acceptance of CCS is important if it is to become a viable solution.

Cost

SEPA is of the view that the energy market could be designed to give the right price signals to encourage CCS. The Parliamentary Office of Science and Technology believes that the cost of generation including CCS could be competitive with wind power. We would support consideration of introducing appropriate incentives to overcome the barriers, as outlined in the comments on access charges to the grid in the 'Manufacturing and Engineering Capability' section above.

What potential investors in CCS would be looking for most would be some certainty. This would come through:

- A clear legal basis for CCS (few companies will even consider something that is illegal)
- The liabilities for long terms storage are clear or rest with a third party
- The is a stable market for the electricity from a CCS equipped plant
- The long term price of carbon dioxide is stable.

Government incentives and/or funding may be needed with initial projects to assist in the early stages of CCS projects. Short term grants could be made available to help prove long-term viability of technology in relation to reducing CO_2 emissions to atmosphere.

Other mechanisms such as using the Linking Directive and alterations to the EU ETS rules (such as full auctioning of allowances for large power plants/large emitters) should also be explored.

SEPA considers it important that financial incentives for CCS projects should not take funding or focus away from developing clean alternative renewable energy sources.

SEPA