Carbon capture and storage:

A consultation on barriers to commercial deployment

March 2006

HM TREASURY

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Introduction

1.1 Climate change is the most serious environmental challenge we face. Rising carbon emissions, linked to the wider issue of our increasing demand for energy and continued dependence on fossil fuels, have already started to raise global temperatures. The emissions that cause climate change need to be tackled if the benefits and progress already achieved in economic growth and investment are to be sustained. To address this, the UK has a Kyoto commitment to reduce greenhouse gas emissions by 12.5 per cent on 1990 levels over the years 2008 to 2010. In addition, the Government has set a domestic goal to reduce UK carbon emissions to 20 per cent below 1990 levels by 2010.

1.2 Power production is responsible for over 29 per cent of global carbon dioxide (CO_2) emissions - CO_2 being the main greenhouse gas. In the UK, about 70 per cent of our electricity comes from fossil fuel generation. It is, therefore, a key challenge for energy policy, both in this country and internationally, to mitigate the impact of power generation based on fossil fuels.

1.3 The Government's energy policy goals are set out in the 2003 Energy White Paper (EWP).[1] They are to:

- Put ourselves on a path to cut the UK's CO_2 emissions by some 60 per cent by about 2050, with real progress by 2020;
- Maintain the reliability of energy supplies;
- Promote competitive markets in the UK and beyond, helping to raise the rate of sustainable economic growth and improve our productivity; and
- Ensure every home is adequately and affordably heated.

1.4 The Government's Energy Review[2] is reviewing progress against these goals and looking at options for further steps to achieve them.

1.5 The energy policy framework within which these goals are pursued combines competition where it is desirable and regulation when it is necessary. Specific investment decisions under that framework are made by energy companies and by business more generally. The Government's role is to ensure that the right framework is in place and, in terms of environmental protection, to ensure that carbon emissions reductions are delivered in the most cost-effective way.

1.6 An important contribution to the Government's energy policy objectives could be made by carbon abatement technologies (CATs) which enable fossil fuels to be used with substantially reduced CO_2 emissions. The most radical CAT option is carbon capture and storage (CCS) in which CO_2 is captured and committed to long-term storage (sometimes referred to as sequestration) to prevent it entering the atmosphere.

1.7 While CCS appears to offer the potential to reduce carbon emissions from future use of fossil fuels, the emerging status of the technologies means that there is still

[1] *Our Energy Future – Building a Low Carbon Economy*, DTI, February 2003

[2] The consultation document, *Our Energy Challenge: Securing clean, affordable energy for the long-term*, was launched on 23 January 2006 by the Secretary of State for Trade and Industry and is available at www.dti.gov.uk

uncertainty about its development and economic feasibility. As such, the 2005 Pre-Budget Report announced that the Government would consult on:

- **Barriers to wide-scale commercial deployment of CCS in the UK; and**
- **The potential role of economic incentives in addressing those barriers.**

1.8 This consultation invites answers to questions that aim to establish the extent to which there are barriers to commercial deployment and whether and how these could be addressed. Specifically, the consultation aims to build understanding on: the current state and future development of CCS technologies and the likely costs attached to deploying them commercially; the potential carbon savings available from CCS; the barriers which currently exist to further development and commercial deployment; and whether there is a case for Government intervention and if so the forms this might take. Other relevant information on CCS which falls outside these questions would also be welcomed.

1.9 The deadline for responses is 11 May 2006. This eight-week consultation period has been set (rather than the normal 12 week period) to allow responses to be fed into the wider review of energy policy that is currently underway.

1.10 Responses should be sent to:

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1.11 A summary of responses will be published on the HM Treasury website – www.hm-treasury.gov.uk by September 2006. A paper copy of the summary will also be available from Katherine Mansfield.

1.12 According to the requirements of the Freedom of Information Act 2000, all information contained in responses, including personal information, may be subject to publication or disclosure. Where respondents request that information given in response to the consultation be kept confidential this will only be possible if it is consistent with this Department's freedom of information obligations.

1.13 A list of those consulted is attached as an annex. Suggestions of others who may wish to be involved would be welcomed. Please contact Katherine Mansfield.

1.14 This consultation is being conducted in line with the Code of Practice on Consultation. The criteria are listed below (a full version of the criteria can be found at www.cabinet-office.gov.uk).

The six consultation criteria:

1. Consult widely throughout the process, allowing a minimum of 12 weeks for written consultation at least once during the development of the policy;
2. Be clear about who may be affected, what questions are being asked, and the timescale for responses;
3. Ensure your consultation is clear, concise and widely accessible;
4. Give feedback regarding the responses received and how the consultation process influenced the policy;
5. Monitor your department's effectiveness at consultation, including through the use of a designated consultation co-ordinator; and
6. Ensure your consultation follows better regulation practice, including carrying out a Regulatory Impact Assessment if appropriate.

1.15 If you feel that this consultation does not fulfil these criteria please contact:

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1 Horse Guards Road
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Email: julie.humphreys@hm-treasury.gsi.gov.uk

CCS: what it involves

1.16 There are three processes at the heart of the CCS concept:

- Capture: This involves isolating and capturing CO_2 either prior to fuel combustion (pre-combustion) or post-combustion by separating it from the flue gases. Potentially, CO_2 might be captured from power plants and other large stationary sources;
- Transport: By either tanker or pipeline, with the pipeline option being particularly effective for larger volumes; and
- Storage: In order to prevent the CO_2 entering the atmosphere, it must be stored over the long-term. Geological formations, such as depleted oil reservoirs, depleted natural gas fields, deep saline aquifers and unmineable coal seams, appear to offer potential for the long-term security which would be required. While direct injection into the oceans has been the subject of discussion, this consultation does not address this approach because of uncertain impacts on the ecosystem and eventual equilibration of the gas with the atmosphere.

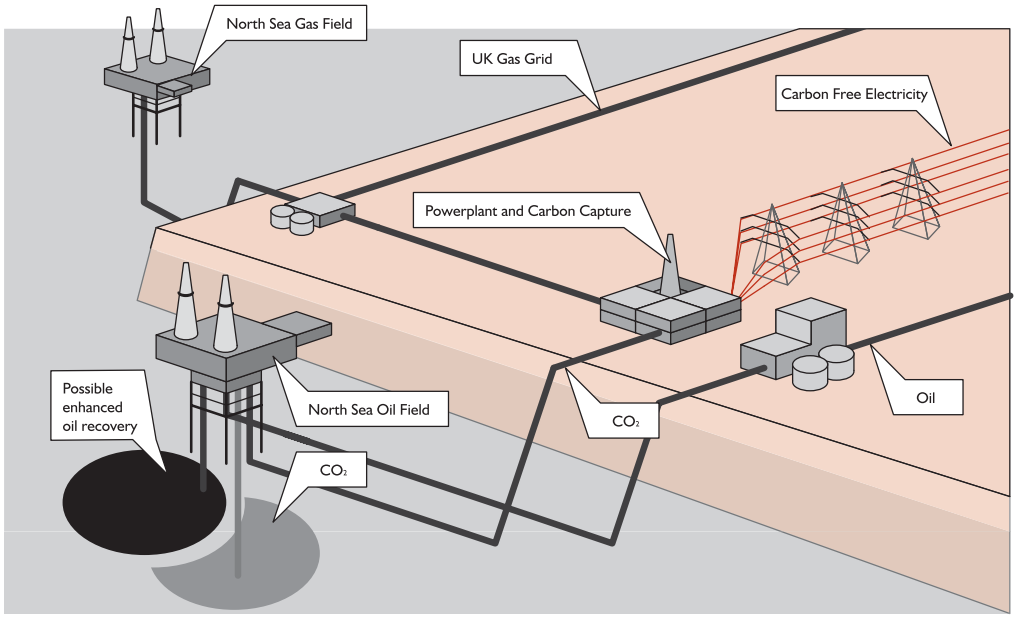
1.17 CCS may be used for enhanced oil recovery (EOR) and also enhanced gas recovery (in this document, the terms "EOR" and "enhanced oil recovery" should be read as including, where relevant, enhanced gas recovery). This involves pumping CO_2 into near-depleted fields to facilitate additional recovery of oil or gas which would otherwise remain in the ground. In the case of oil, for example, the CO_2 either renders the remaining oil more mobile and easier to extract or it forms a pressurised gas pocket which forces out the oil. However, there are alternative, non-CCS related methods of EOR which might be more appropriate and cost-effective depending of the characteristics of the field concerned. In other words, CCS could take place without EOR.

1.18 Development of CCS is at a relatively early stage. The International Energy Agency have said that, "large-scale uptake of capture and storage technologies is probably ten years off".[3] To date, a small number of projects have been undertaken using CO_2 for EOR and subsequent storage. Capture of CO_2 from energy generation is still at the demonstration stage. What is more, there is limited experience of integrating the three CCS processes at industrial scale.

1.19 One consideration is how to lay the groundwork for possible larger-scale implementation in the future. There is a growing interest in building a capture-ready plant – which is to say a plant, probably coal or natural gas-fired, designed and constructed to make later retrofitting of CO_2 capture equipment more straightforward and less expensive.

[3] *Prospects for CO_2 Capture and Storage*, International Energy Agency, 2004

Diagram of a possible CCS project



1.20 For the most part, this consultation refers to CCS as a single concept recognising that there are cross-cutting issues across the different energy activities. However, a single analysis of CCS across the piece may present difficulties. Different issues may be relevant to different aspects of, and processes within, CCS (so, for example, the barriers to CCS for power generation from coal may not be the same as the barriers to CCS for power generation from gas). It would be useful if respondents could think about how the issues raised in this consultation relate to particular aspects of CCS as well as to CCS as a whole.

The context: carbon abatement and energy policy

1.21 As the Energy White Paper (EWP) made clear, fossil fuels are likely to continue to play a significant role in electricity generation in the UK, in particular if cost-effective methods can be established to reduce their output of harmful emissions.

1.22 The EWP said that the application of CCS to UK power generation was a promising way forward for CO_2 emissions reduction. The Government's commitment to investigating the opportunities offered by CCS was reiterated in Budget 2005 and reflected in the Department for Trade and Industry's (DTI's) Carbon Abatement Technologies Strategy (CAT Strategy).[4] Through the Strategy, there will be support for elements of demonstration of CO_2 capture-ready plant, capture technologies and storage. The Strategy will also examine possible measures to encourage the initial commercial deployment of CCS technologies in the UK.

1.23 In the 2005 Pre-Budget Report, the Government announced a further £10 million funding for demonstrations of carbon abatement technologies, with this money being allocated to CCS projects. This was on top of £25 million which had already been made available over four years from 2006-07 for demonstrations of CCS, hydrogen and

[4] *A Strategy for Developing Carbon Abatement Technologies for Fossil Fuel Use*, DTI, June 2005

fuel cell technology. DTI is also supporting research and development and facilitating international collaboration.

1.24 In addition, the UK has agreed to work collaboratively with Norway on the issues surrounding the costs of and barriers to CCS, with a memorandum of understanding between the two countries being signed in November 2005. As part of this, a North Sea Basin Task Force was established, made up of public and private organisations from the North Sea rim, to develop broad, common principles on the regulation and management of CO_2 storage in the North Sea.

1.25 As an international leader on climate change, the UK Government is determined to remain at the forefront of developments. Therefore, during the 2005 UK Presidencies of the European Union (EU) and the G8, the Department for the Environment, Food and Rural Affairs (DEFRA) and the DTI initiated a project aiming to build a demonstration zero-emissions coal plant, including CCS, as the centrepiece of the EU-China Partnership on Climate Change.

1.26 The current Energy Review is examining the potential impact of trends that put at risk, in the medium and long-term, the UK's progress against the energy policy goals set out in the EWP, and is conducting an assessment of future energy policy options. The Review is considering all aspects of the energy system, including both energy supply and demand. The Review consultation document *Our Energy Challenge: Securing clean, affordable energy for the long term* was launched on 23 January.

1.27 All options are under consideration by the Review including the role of current generating technologies (e.g. renewables, coal, gas and nuclear power) and new and emerging technologies (e.g. CCS). It will also consider transport and the role of energy efficiency. The results of this consultation on CCS will be fed into the Energy Review.

The experience of other countries

1.28 A variety of CCS projects are being undertaken in other countries. Examples are given below. While there are a small number of relatively large-scale projects, what is clear is that the experience of integrating the three CCS processes at an industrial scale is limited. To date, projects have tended to focus on geological storage and EOR although projects for power generation are planned for the future:

- The Sleipner Project on the Norwegian continental shelf has involved the injection and storage of 1 million tonnes per year (Mt/yr) of CO_2 removed from natural gas since 1996 into a shallow aquifer formation. Consideration is being given to a second project, operated by Statoil, on a similar scale for the Snøhvit gas field in the Barents Sea;

- The Great Plains Synfuels Plant in North Dakota, USA, is currently separating 2Mt/yr of CO_2 using pre-combustion methods. The CO_2 is transported through a 330 kilometre pipeline and used for EOR in Canada's Weyburn oil field. EnCana have been using this CO_2 to enhance oil recovery at Weyburn since October 2000;

- The US Department of Energy has established the FutureGen programme to design and construct a zero-emissions coal-fired power and hydrogen plant. The US Government plans to provide 80 per cent of the $1 billion estimated cost and the construction stage is expected to start between 2008-2010;

- BP and Sonatrach have recently commissioned a project based in the In Salah gas field in Algeria to inject 1.2Mt/yr of CO_2 separated from natural gas into an aquifer below the gas reservoir;
- Shell and Statoil have recently announced that they have agreed to work towards developing the world's largest project for CCS incorporating EOR, with elements of the project being phased in during the period 2010-2012. The proposal consists of a gas-fired power plant and methanol production facility at Tjeldbergodden in mid-Norway, providing CO_2 to the Draugen and Heldrun offshore oil and gas fields. The intention is that energy from the plant will also be used to power the offshore fields; and
- Among projects under consideration for the future in the UK is the BP and Scottish and Southern Energy proposal to take over 1 million tonnes of CO_2 from the Peterhead power station and use it for EOR in the Miller oil field.

1.29 Integrated CCS demonstration projects are under discussion in the European Union, Canada and Australia. In addition, a number of smaller pilot and demonstration projects are taking place around the world.

The commercial deployment of CCS in the UK

1.30 There are several important issues that need to be understood in order to establish whether there is a case for incentivising the development and use of CCS in the UK. These issues can be grouped under five main headings: potential carbon reductions; technology; engineering and manufacturing capability; regulation, liability and public acceptance; and cost. Building the evidence base on these issues will make the Government better placed to understand how the potential impact of CCS compares to alternative options and where barriers to development might exist. This, in turn, will help to establish the economic context and the case, if any, for economic incentives.

1.31 Further detail on these five issues is set out below, with particular key questions highlighted. Views are welcomed on these specific questions as well as on any others not covered. The overarching question is:

- **What are the barriers to commercial development of CCS?**

Potential carbon reductions

1.32 A key part of the Energy Review is to identify the reductions that could be achieved in CO_2 produced by energy generation. CCS is a technology that could potentially contribute to significant reductions in CO_2 emissions from energy supply and industry in the UK. To understand the role CCS might play in reducing UK emissions, it is important to be able to compare potential carbon savings from CCS against carbon savings that could arise from other options - such as increasing use of renewable energy sources. As such, views would be welcomed on the following questions relating to CO_2 emissions:

- **What CO_2 savings could be delivered by CCS, and how do these savings vary between different options for deployment, different fuels, and different kinds of technology at each stage of the CCS process? Can the life-cycle CO_2 savings be estimated comparably with those of other technologies? and**
- **How do the potential CO_2 savings compare with other options for reducing carbon emissions?**

Technology

1.33 Within each of the three elements of the CCS process – capture, transportation, and storage – there are various technological options that might be used. Much of the technology associated with these individual elements of CCS has already been developed for commercial use. For instance, technologies needed for CO_2 capture are in commercial use for applications other than storage. CO_2 is commonly transported by both pipeline and ship. Geological storage of CO_2 has also been established over normal engineering timescales, particularly for the purposes of enhanced oil recovery.

1.34 However, these technologies have, in the main, not yet been brought together commercially as a means of reducing CO_2 emissions from electricity production or other large-scale fossil fuel combustion. Moreover, in each element there are a number of different possible technologies available and being developed – for example, pre- and post-combustion technologies and their application to capture from gas and from coal. There are also different kinds of application – for example new-build and retrofitting. For CO_2 storage, the integrity of different kinds of geological formation over long timeframes remains to be established. At present, therefore, there remains considerable uncertainty about the relative strengths and viabilities of the various technological options and, in particular, about how the different elements could be combined. Views are therefore welcomed on the following questions relating to technology:

- **What are the different technological options currently available and in development for each stage of the CCS process – and what are the costs of these options?**
- **What scope is there for applying these technological options to different forms of power generation (particularly gas and coal) and other large-scale sources of CO_2 emissions, and can they be installed on the basis of both new-build and retrofitting?**
- **At what level of market readiness are these various technological options? and**
- **What limitations exist when it comes to selecting from the options at each stage to form a full CCS process?**

Engineering and manufacturing capability

1.35 The UK has a strong business capability with carbon abatement technologies (CATs) generally. This capability takes in design, development, and manufacture relevant to this type of technology. More broadly, we have experience of designing and constructing fossil fuel power plant, both coal and gas. We also have strong capabilities in offshore engineering, oil and gas extraction and geological science needed to appraise, operate and monitor CO_2 storage sites. However, experience of the manufacturing of these technologies for CCS purposes is limited in the UK. Views are therefore welcomed on the following questions relating to the manufacture of CCS:

- **What would be the costs and benefits of early adoption of this technology in the UK? and**
- **Are there skills gaps that could create barriers to the development of CCS in the UK?**

Regulation, liability and public acceptance

1.36 There are wider contextual issues that need to be considered when thinking about the possible development of CCS in the UK. The regulatory framework will be an important element for the development of CCS. For example, where CO_2 is stored offshore, injection into such repositories is governed by treaties designed to protect the marine environment from the disposal of matter. The treaties, which were negotiated before there was an awareness of the possibility of CO_2 injection, could restrict storage operations. The UK is working with other parties to consider how clarification or amendment of the treaties will help facilitate and regulate CCS.

1.37 Further regulatory controls might need to be established to ensure appropriate protection for the environment and human health. In particular, regulation of the storage of CO_2 would need to be put in place. The North Sea Basin Task Force is considering issues in this area.

1.38 Other regulatory issues might include: the establishment of appropriate risk assessment criteria; the setting of requirements for providing information to the Government; and the provision of fair and equal third party access to transport and storage infrastructure.

1.39 There are also issues about liability. Stored CO_2 would represent a potential liability and there would be costs associated with monitoring. And there is the question of who would have liability for the CO_2 at the various earlier points in the CCS process (e.g. during transport and EOR operations).

1.40 Long-term storage also creates public accountability issues. In particular, there might be concern about the potential escape of CO_2 from pipelines and geological formations. This is relevant not only because it might become a source of public resistance to the development of CCS but also because the public would be effective stakeholders in any incentive mechanism.

1.41 Views would be welcomed on the following questions relating to these issues:

- **What scope is there to develop and use CCS within the current regulatory framework?**
- **What regulatory framework would need to be put in place to support the development of CCS technology while also ensuring protection of human health and the environment?**
- **What additional costs and considerations are created by the long-term liability implications attached to CCS, and how can these be best managed?**
- **What issues arise concerning (short-term) liability for CO_2 at particular points in the CCS process? Are there costs attached to these and what are they? and**
- **What might be the likely public reaction to concerns about CCS, and how could concerns be addressed?**

Cost

1.42 The potential commercial viability of CCS technologies is closely linked to cost considerations, and hence it is useful to understand how the costs of CCS compare with other low carbon technologies. There remain considerable uncertainties about these costs. Designs for CO_2 capture plants based on current technologies involve substantial capital investment and a significant efficiency penalty associated with operating the plant and compressing the CO_2 for transport and storage. These create additional costs.

It is likely that the development of new technology with improved performance will require further expenditure on research and development and demonstration projects.

1.43 Table 1 below sets out some indicative costs of producing electricity using various CCS technologies. These figures suggest, as would be expected, that it is more costly to generate electricity with CCS than using non-CCS gas and coal technologies. It will be important for the Government to have a good, current evidence base and understanding of the costs on a commercial scale so that decisions about the viability and cost-effectiveness of CCS can be established.

Table 1: cost to produce electricity using various technologies in pence per kilowatt hour (p/kWh)

Technology	p/kWh
Gas 2000	2.2 – 2.4
Gas 2020	2.1 – 2.2
Coal 2000	3.6 – 3.9
Gas (carbon capture and storage) 2000	3.5 – 3.7
Gas (carbon capture and storage) 2020	3.0 – 3.2
Coal (carbon capture and storage) 2000	5.7 – 6.1
Coal (carbon capture and storage) 2020	4.5 – 4.9

Note: 2000 means plants built in the decades 2000-2010 etc.

For the EWP, the Government commissioned additional external modelling work from Future Energy Solutions (FES) using the Markal model. Assumptions made included the costs of both gas and coal-fired generation (with and without CCS). These estimates were based on the experience of the modelling team but were also discussed at a workshop with representatives from the key generation technologies. Since the publication of the EWP, assumptions for fossil fuel prices would now be higher and this would affect the future cost of gas-fired generation.

1.44 The economics of CCS will clearly be affected by the relative prices of coal and gas in the future, as well as the framework governing emissions of CO_2 and other pollutants.

1.45 The cost of building capture-ready plant (a plant intended for the later retrofitting of CCS technologies) is a further issue on which the evidence base needs to be developed. There is a lack of clarity as to whether the cost would be the same, similar or very different to the cost associated with developing a fully operational CCS facility.

1.46 Enhanced oil recovery (EOR) presents an opportunity for business to use the captured CO_2 to obtain higher quantities of oil from existing sites. Indeed, the maturing oil fields in the North Sea may offer potential for the use of EOR. If so, it might help to reduce the cost of CCS for business and possibly increase profitability of installing CCS technologies. However, a consultation of oil producers conducted by the DTI showed that EOR was not commercially viable at the oil price scenarios then applied by producers. Higher oil prices since this survey may change the economics, however. This

uncertainty needs to be explored to ascertain the true viability of EOR, as part of the wider building of the evidence base on the economics of CCS.

1.47 If oil prices represent one aspect of economic uncertainty around EOR, another centres on considerations of geology and location. The potential for additional oil recovery will be highly dependent on the geological characteristics of each particular field. Location – distance from the capture plant – will be a major influence on the cost, particularly transport cost, of EOR activities.

1.48 Views are therefore welcomed on the following questions about the costs associated with CCS:

- **What are the costs currently associated with the development of different potential CCS technologies and forms of deployment?**
- **How might these costs change over time and what is the evidence for any estimates of this?**
- **How might changes in the relative prices of coal and gas in the framework governing emissions of CO_2 and other pollutants affect the costs and profitability of CCS?**
- **To what extent does EOR reduce costs and increase the commercial viability of CCS?**
- **How does EOR using CO_2 compare in cost terms to EOR using other means?**
- **Is the use of CO_2 for EOR appropriate on the UK continental shelf and at what stage in the life of a specific field is it appropriate to use EOR?**
- **What are the costs associated with building capture-ready plant and how do they differ from the cost of constructing fully operational CCS facilities? To what extent can any additional costs be mitigated by decisions on design, location etc? and**
- **Is the use of CCS currently a profitable option for businesses in the electricity supply sector and other sectors and, if not, what is the shortfall? Under what conditions might it become profitable?**

Is there a case for economic incentives for CCS?

1.49 Our energy policy goals reflect the fact that private sector companies in competitive markets produce the country's energy needs and markets play a crucial role in delivering clean, reliable energy and ensuring that costs are as low as possible. It is, therefore, right that specific investment decisions should be made by energy companies and by business more generally. Equally, the commercial sector should expect to bear normal commercial risk in making these decisions.

1.50 At the same time, economic incentives can play an important role in helping to achieve environmental improvement where there are market failures and other barriers to the securing of public goods and where the full environmental costs of economic activity are not being internalised. The framework within which Government intervention is considered was set out in the Principled Approach outlined in the 2005 Pre-Budget Report (see box below). If the case for intervention can be made, it is important to use the most cost-effective and well-targeted instruments.

Principles of environmental policy making

- The decision to take action must be evidence-based;
- Any intervention to tackle environmental challenges must take place at the appropriate level;
- Action to protect the environment must take account of wider economic and social objectives;
- Action on the environment must be as part of a long-term strategy;
- The right instrument must be chosen to meet each particular objective; and
- Where tax is used, it will aim to shift the burden of tax from 'goods' to 'bads'.

1.51 CO_2 reduction from the energy and business sectors is already the subject of a comprehensive policy framework. Principal measures include the following:

Climate Change Levy (CCL): CCL was introduced in 2001 to encourage business to use energy more efficiently and to help the UK meet its targets for reducing greenhouse gas emissions. It is levied on use by the non-domestic sector of electricity, gas, coal and liquefied petroleum gas (LPG) used for energy. Exemptions from CCL include one for energy generated from less polluting, renewable sources. Companies in energy-intensive sectors that sign up to Climate Change Agreements to increase energy efficiency are eligible for an 80 per cent reduction in tax. A document on the impact of the CCL package is being published separately (at Budget 2006).

Enhanced Capital Allowances (ECAs): Since April 2001, spending on certain long-life plant and machinery (with an economic life of 25 plus years), including long-life good quality combined heat and power (CHP) assets, has been able to qualify for 100 per cent first-year capital allowances.

The European Union Emissions Trading Scheme (EU ETS): EU ETS came into force in January 2005. It is the first international CO_2 trading scheme and sets an emissions limit for 12,000 installations covered by the Scheme across the 25 EU Member States. Respondents will wish to note that work which is underway within the EU Climate Change Programme includes development of a CO_2 monitoring and verification framework that could allow CCS to be included in EU ETS.

1.52 Other measures in the area of energy include the fact that 100 per cent relief is currently available within the North Sea fiscal regime for virtually all capital expenditure spent as part of oil and gas extraction activities in the UK or on the UK continental shelf. As announced at the 2005 Pre-Budget Report, the Government has opened discussions with the oil and gas industry to examine wider structural issues for the North Sea fiscal regime.

1.53 The Energy Review is now considering possible mechanisms for reducing CO_2 in the future, working on the basis that reduction mechanisms should be cost-effective. The information requested in this consultation document will help the Government to establish whether or not there is a case for Government intervention to incentivise CCS

as part of a wider policy framework which seeks to reduce carbon emissions. If this case were established, the Government would need to give consideration to the incentive mechanisms that might be used. When examining policy towards reducing CO_2, the list of possible instruments normally includes regulation, subsidies, tax, trading schemes and obligation schemes. In recent months the idea of using "carbon contracts" has also been suggested.

1.54 Views are welcomed on the following:

- **What is the impact of the current policy framework on the development of CCS? and**
- **Are there any particular issues that need to be taken into account with regard to CCS when considering the use of policy mechanisms to reduce CO_2 emissions in the UK economy?**

Conclusion

1.55 There is no one solution to the challenge of climate change. However, it may be that CCS has the potential to play an important role. CCS could also contribute to energy security and reliability.

1.56 The Government is committed to building up a more detailed knowledge of CCS. Both this consultation exercise and the Energy Review will help establish information on the opportunities and barriers to commercial deployment. It represents a step towards building an evidence base for economic incentives as well as opening up an early discussion on what those incentives might look like.

1.57 The Government welcomes responses to the specific questions asked and any additional contributions relevant to issues raised by this subject.

A Annex: List of consultees

ALSTOM

Association for the Conservation of Energy

Association of Electricity Producers

BP

British Geological Survey

Campaign Against Climate Change

Carbon Capture and Storage Association

Carbon Trust

Climate Outreach and Information Network

CoalPro

Costain Oil, Gas and Process

Drax Power Ltd

E.ON UK

Energy Institute

Environment Agency

Forum for the Future

Friends of the Earth

Future Energy Solutions

Green Alliance

Greenpeace

IEA Greenhouse Gas and R&D Programme

Imperial College, Centre for Energy Technology

Jacobs Engineering Ltd

Mitsui Babcock

National Energy Action

Progressive Energy UK Ltd

Rolls Royce Plc

RSPB

RWE nPower

Scottish and Southern Energy PLC

Scottish Environment Protection Agency

Scottish Power

Shell

Society of British Gas Industries

Stop Climate Chaos

Sussex Energy Group

Sustainable Development Commission

Sustainable Hydrogen Energy Consortium

Synnogy Ltd

Tyndall Centre

UK Business Council for Sustainable Energy

UK Coal

UK Offshore Operators Association

UK Petroleum Industry Association

UKOITC

University of Ulster, Energy Research Centre

Wildlife Trusts

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