

Green Alliance response to HM Treasury consultation Carbon capture and storage: A consultation on barriers to commercial deployment

Introduction

Green Alliance supports the development of Carbon Capture and Storage Technologies (CCS) as part of the transition to a low carbon energy system. However they must not be seen as an alternative to, or substitute for, the continued development of renewable energy, energy conservation and demand reduction measures.

When applied on a global scale, the attractions of CCS technology are understandable. It is particularly applicable to growing economies, like China, with an extensive program of new coal power-station construction.

Green Alliance is concerned that the role CCS can play in climate change mitigation in the UK is not overstated. The availability of CCS should not be used as an excuse to deepen dependence on fossil fuels as energy sources. However, CCS could be used, under certain conditions, in order to gain the time to switch to a genuinely low-carbon energy system.

Prior to any full support of this technology Green Alliance has a number of concerns about the development and regulation of CCS that need to be addressed. These relate to:

- a) the legal status of CCS, particularly regarding the OSPAR and London Convention;
- b) the support for the technology and its effect on other carbon abatement technologies;
- c) the liability and safety of long-term storage;
- d) the feasibility of the technology.

Green Alliance supports the development of 'pathfinder' projects to bring forward the development of CCS and explore the various technologies available and confirm whether or not it is environmentally, technologically and economically acceptable. It appears that CCS could be brought forward considerably faster than nuclear power, as confirmed by the growing numbers of demonstration projects proposed. For these projects to proceed as quickly as possible, rapid progress is needed to resolve a number of legal, technical and financial issues.

This response will focus on the regulation and support mechanism for CCS, we have not attempted to answer all the questions in the consultation.

The UK's energy system and the role of carbon capture and storage

By 2016, it is likely that between 15 and 20GW of electricity generating plant will be decommissioned, amounting to nearly a quarter of total UK generating capacity. As a result, over the next nine years substantial investment in new generating capacity and energy efficiency will be required.

In relation to coal plant:

- Most existing coal generating plant was built in the 1960s and 1970s and is now reaching the end of its life;

- The introduction of the Large Combustion Plant Directive (LCPD) will impose stringent new emission limits on sulphur dioxide from 2008. In order to conform to the Directive, many coal plants will need to fit flue-gas desulphurization. Where this is uneconomic, plants can continue to operate until 2015 but only at a reduced level.

At the same time, the UK needs to radically reduce its carbon emissions to combat global warming. The electricity-generating sector accounts for nearly a third of total emissions and it will therefore need to play a significant role in achieving such reductions. The achievement of the 2050 target (of a 60% reduction in emissions on 1990 levels) will depend heavily on the nature of investment in generating capacity over the next two decades.

By 2016 at the latest, the UK will need to have invested substantially in generating capacity, and there are a number of different lower-carbon technologies which could conceivably contribute on a large scale—including renewables, microgeneration, offshore wind, nuclear, and carbon capture and storage.

It is likely that gas and coal will play a role in the electricity generating mix for decades to come. Since 2000 coal has enjoyed an unexpected resurgence in the UK market — largely because of the increase in the price of gas (coal currently accounts for 33% of electricity generation)¹. It is interesting to contrast the projections offered in EP68 (the DTI Energy Projections paper dating from 2000) with both the current energy mix and with DTI's most recent forecasts. EP68 forecasted that coal would be phased out to provide only 10 per cent of the market by 2015 and that as a result emissions from the power-generating sector would steadily decline.² In reality EP68's projections proved incorrect, the most recent DTI forecasts now predict that coal will still constitute 25 per cent to 30 per cent of the total mix in 2015.³

Modelling for WWF by Ilex Consulting⁴ shows that in the two low emissions scenarios gas will still account for 65 per cent of the power market in 2025. Beyond 2025, gas use could be expected to decline through policies to reduce energy demand, further development of renewables and technological innovation, potentially including CCS.

Conventional coal-powered generators are inefficient and per unit of electricity generate far more carbon emissions than Combined Cycle Gas Turbine plant (CCGT). It has been suggested that the retro-fitting of super-critical boilers could help contribute substantially to carbon reductions. More significantly, it is estimated that the development of carbon capture and storage (CCS) could reduce carbon emissions from plant by 80 to 90 per cent.⁵

The 2003 Energy White Paper (EWP) dedicated a six-month research project to take CCS forward. This recognized that there was only a limited window of opportunity for using depleted North Sea oil fields as a means of sequestering carbon dioxide. Once they were closed, it would not be worthwhile to reopen them to sequester carbon;

¹ DTI Dukes 2005, p118 and table 5.6. Figures quoted are on a gross output basis.

² Based on EP68's CL scenario (table 5.1, page 41). See also EP68 Annex B, which shows that emissions from coal were expected to fall steadily by 10MtC (LH scenario) or 20MtC (LL scenario).

³ DTI, *Updated Energy Projections*, February 2006, tables 27 and 28.

⁴ Report by ILEX consultants for WWF-UK 'The Balance of Power', May 2006, <http://www.wwf.org.uk/climatechangecampaign/publications.asp>

⁵ IPCC, *Carbon Capture and Storage: Summary for Policy Makers and Technical Summary P3*, Nov 2005, <http://www.ipcc.ch/activity/ccssp.pdf>

whereas, while they were still in use, CCS could assist in recovering more oil from each field than would otherwise have been economically profitable.

The White Paper stated the following: *'We will... set up an urgent detailed implementation plan...to establish what needs to be done to get a demonstration project off the ground. This study will reach conclusions within six months to enable firm decisions to be taken on applications for funding from international sources as soon as possible thereafter.'*⁶ It is now three years after this statement was published and despite a number of relevant documents (including a review of the feasibility of carbon capture and storage⁷, a paper on implementing a demonstration project⁸, and a carbon abatement strategy⁹) little progress has been made.

⁶ DTI, *Energy White Paper*, February 2003, paragraph 6.63.

⁷ DTI, *Review of the Feasibility of Carbon Dioxide Capture and Storage in the UK*, September 2003.

⁸ DTI, *Implementing a Demonstration of Enhanced Oil Recovery Using CO₂ in the North Sea*, May 2004.

⁹ DTI, *A Strategy for Developing Carbon Abatement Technologies for Fossil Fuel Use*, June 2005.

Response to consultation questions

The commercial deployment of CCS in the UK

- What are the barriers to commercial deployment of CCS?

There are several barriers to commercial deployment of CCS in the UK. These include:

- the lack of a long-term carbon price and clarity over potential support mechanisms for the technology;
- the current position that CCS holds under the EU ETS, Kyoto Protocol and under the OSPAR and London Conventions and the unknown timescale it will take to clarify these;
- lack of clarity over future liability and regulation;

- How do the potential CO₂ savings compare with other options for reducing carbon emissions?

Following two years of analysis, a series of earlier reports on energy¹⁰ and ‘the most significant consultation on energy policy ever undertaken in the UK’¹¹ the 2003 Energy White Paper (EWP) set out a bold framework for policy development over the next fifty years.

The EWP’s vision for reducing emissions was ‘to strengthen the contribution of energy efficiency and renewable energy sources’¹² and acknowledged that energy efficiency was likely to be the cheapest and most efficient way of achieving all EWP four goals. Over half of the CO₂ reductions expected for the national target of a 60 per cent cut in emissions were envisaged to be met by cuts in energy demand. It aimed to do this by setting in train a number of processes, many of which have not yet had enough time to fully develop. These include the Renewables Obligation Review, Microgeneration Strategy, Energy Efficiency Innovation Review and the review of Building Regulations, which have all only been completed in the last few months.

These innovations in energy efficiency, demand reduction and support for renewables need more time to deliver and any change in tack will undermine progress made so far. With enough time, emphasis and resources the so-called ‘energy gap’ could be reduced before other options need to be considered to fill it.

Green Alliance therefore believes that the priority should be to develop these options before looking at other technologies such as CCS.

The IPCC concluded in 2005¹³ that CCS could contribute from 15 to 55 per cent of the global effort to reduce carbon emissions by 2100 and modelling by Ilex Consulting for

¹⁰ DTI, *New and Renewable Energy: Prospects in the UK for the 21st Century*, 1998. <http://www.dti.gov.uk/renew/condoc/support.pdf>; Royal Commission on Environmental Pollution, 22nd Report. *Energy: The Changing Climate*, 2000; Performance and Innovation Unit

¹¹ EWP, P20

¹² EWP P12

¹³ IPCC, *Special report on CCS*, http://arch.rivm.nl/env/int/ipcc/pages_media/SRCCS-final/IPCCSpecialReportonCarbondioxideCaptureandStorage.htm

WWF¹⁴ has shown that CCS is a potentially viable option in the UK for reducing further reliance on gas for power generation whilst also reducing CO₂ emissions. This modelling showed that 4GW of coal-fired CCS could supply some 6 per cent of total electricity demand in 2025.

Green Alliance therefore sees CCS as a bridging technology, to work alongside energy demand reduction, energy efficiency and renewables.

Technology

- At what level of market readiness are these various technological options?

Whilst Green Alliance is unable to comment on the specific technologies and their market readiness we urge the industry to demonstrate as wide a range of technologies as possible in its pathfinder projects. This would enable assessment of the market possibilities of the various different forms of CCS and show whether it is a valid carbon abatement option and environmentally, technologically and economically acceptable.

Regulation, liability and public acceptance

- 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?

The regulatory framework should cover all the risks and uncertainties related to CCS and include full public consultation. An Emergency Management Plan for each site should be set up and a full Environmental Impact Assessment carried out. Each site should prove its net environmental gain to avoid an increase in conventional pollution as a result of the introduction of CCS.

Green Alliance does not support the storage of CO₂ in the open ocean, open aquifers, lakes or on the sea floor. We believe that geological storage in certain rock formations such as oil and gas fields and saline aquifers could be acceptable. Yet whilst the science and geology of disused oil and gas fields is relatively well known, more research is needed to improve the gaps in the knowledge base.

Independently verified pilot projects should test the effects on biodiversity, geological suitability and the security and permanence of carbon stored in geological strata. Any research undertaken should cover: environmental consequences including those associated with fossil fuel extraction; capacity of safe, long term underground storage of carbon; risks to public safety; characteristics of the currently much less understood saline formations. Research should be ongoing into the safety and security of storage.

CO₂ should be stored safely and permanently in locations that do not allow any leakage rate higher than that from conventional natural gas fields.

¹⁴ Report by ILEX consultants for WWF-UK 'The Balance of Power' (May 2006) available at: <http://www.wwf.org.uk/climatechangecampaign/publications.asp>

An independent monitoring body should be established and given responsibility for storage monitoring and verification. The monitoring body should publish an annual audit of the state of the UK's storage sites. There must also be internationally agreed procedures for independent monitoring and verification before CCS technologies should be allowed to count against greenhouse gas reduction targets.

We believe that the government should make capture readiness a requirement for statutory licensing of all new fossil fuel plant. This would compel the developer to demonstrate that consideration has been given in the planning and design of the plant to facilitating subsequent addition of suitable carbon dioxide capture technology as it becomes available and economic.

- What additional costs and considerations are created by the long-term liability implications attached to CCS, and how can these be best managed?

Storage of CO₂ will clearly have risks liabilities covering many thousands of years; the government must establish a strict legal framework to regulate this.

Green Alliance does not believe that companies developing CCS should be overly burdened with the long-term liability of the stored CO₂, when other high carbon technologies (such as standard coal plants) have no liability for the emissions they emit into the atmosphere.

A possible solution would be for the liability to remain with the company for a specified period of time and then pass over to the government. Meanwhile it would be appropriate for the industry to set up segregated and secured funds to help cover long-term liabilities.

- What might be the likely public reaction to concerns about CCS, and how could concerns be addressed?

Public concern surrounding CCS is likely to be eased if government and industry can demonstrate that they are implementing adequate regulatory and liability regimes for the development of the technology and storage of the CO₂. Full engagement and consultation with stakeholders should be undertaken at all possible storage sites.

Is there a case for economic incentives for CCS?

- What is the impact of the current policy framework on the development of CCS?

There is substantial evidence to show that progress in deploying key technologies—in particular carbon capture and storage, off-shore wind, and micro-generation - is inadequate. The current policy and regulatory framework in place is insufficient to stimulate the growth of lower-carbon generation on the scale required. The current highly liberalised UK electricity market structure is too short term and therefore fails to provide the framework needed for the full-scale development of CCS.

There are a number of companies considering investing in CCS demonstration projects in the UK, which suggests that industry evidently believes the technology is significantly advanced to proceed with full-scale demonstrations. What is needed now is a commensurate effort from government for these projects. The piecemeal allocation of funding - such as the extra £10 million provided in the pre-budget report shows a lack of strategic vision in government. The government needs to look to the Norwegian government's example of sustained investment in the technology to help get pathfinder projects off the ground.

- 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 CO2 emissions in the UK economy?

Any policy mechanism to support CCS must not divert support away from renewable technologies or the promotion of energy efficiency.

Renewable technologies and the promotion of energy efficiency still require additional support and strong programmes to underpin their adoption and overcome market barriers. Government support of independent, and transparent, research on CCS may be necessary but should not replace or delay government support for existing renewable energy sources, and should be part of a package with a clear priority for energy efficiency and renewables.

The government will need to consider what support mechanism are required to help CCS demonstration projects develop. Further to this, the EU Emissions Trading Scheme (EU ETS) should be the key mechanism to support long-term development of CCS and it should compete on a level playing field with other low carbon technologies.

We support the work that is going on to include CCS plant in the second phase of the scheme but this should only take place in the context of international carbon accounting rules agreed under the UNFCCC.

One of the core purposes of the EU Emissions Trading Scheme is to encourage investment in low-carbon technologies and discourage more polluting methods, yet several features of the scheme will need to be reinforced if it is to deliver its potential to reduce emissions. A robust national emissions cap and longer-term certainty in the scheme would encourage not only the development of CCS but also renewable technologies and increased energy efficiency.

Level of the cap

The effectiveness of the EU ETS in incentivising investment in low-carbon technologies depends on the price of carbon which is influenced by the National Allocation Plans across Member States. The UK government needs to show leadership in setting a robust cap for Phase 2 of the EU ETS that will allow the government to deliver its target of a 20 per cent cut in emissions by 2010 (on 1990 levels). This cap should be set at 60 million tonnes of carbon.

Long-term certainty

The EU ETS, as it currently stands, does not provide sufficient certainty to underpin investment decisions in low carbon technologies. The EU ETS only extends until 2012 and permit levels are only known until 2008. As a result there is no carbon market over

the relevant investment period for CCS. The review of the scheme should therefore consider extending trading periods to longer than five years.

Allocation methodology

Green Alliance supports a move towards 100 per cent auctioning of permits under the EU ETS. This would be the most economically and environmentally efficient option and would ensure that the full costs of carbon are taken into account in investment decisions. For Phase 2 the government should auction the full 10 per cent possible. This would also create a revenue stream that could be used to fund the development of low and zero carbon technologies, including CCS.

Given the lack of clarity as to the future shape of the EU ETS, Green Alliance accepts that there may be a case for introducing a separate mechanism to bring forward the development of CCS pathfinder projects as part of an overarching strategy to develop low and zero carbon technologies.

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