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Energy Review Team
Department of Trade and Industry
1 Victoria Street
London SW1H 0ET

Carbon Capture & Storage Association

Suites 142-152
Grosvenor Gardens House
35/37 Grosvenor Gardens
London SW1W 0BS

t +44 (0)20 7821 0528
f +44 (0)20 7828 0310
e info@ccsassociation.org
www.ccsassociation.org

The Carbon Capture & Storage Association Submission to the DTI Energy Review

Dear Sirs,

Please find below, the response of the Carbon Capture & Storage Association to the DTI Energy Review.

The Carbon Capture & Storage Association (CCSA) exists to represent the interests of its members in the business of capture and geological storage of carbon dioxide (known as Carbon Capture and Storage, or CCS) as a means of abating atmospheric emissions of carbon dioxide and potentially, as a means of enhancing the production of fossil hydrocarbons. From its base in London the Carbon Capture & Storage Association brings together specialist companies in manufacturing & processing, power generation, engineering & contracting, oil, gas & minerals as well as a wide range of support services to the energy sector such as law, banking, consultancy and project management. The Association is a model for sectoral cooperation in business development and its existence is welcomed by government.

This response has been developed over several meetings of the eleven founder members of the Association, namely: Air Products, Alstom, AMEC, BP, ConocoPhillips, EON-UK, Mitsui Babcock, Progressive Energy, Shell, Schlumberger and Scottish & Southern Energy.

We have been advised of the interaction between the HM Treasury consultation on Barriers to Investment in Carbon Capture & Storage to which we intend to submit a more detailed intervention.

Yours sincerely,

Dr Jeff Chapman
Chief Executive

President: Lord Oxburgh KBE
Registered in London
Company number 5650208

Carbon Capture & Storage Association

# Carbon Capture and Storage Association

# Contribution of Carbon Capture and Storage to UK $CO_2$ Emission Reductions

## Our Vision

***The vision of the Carbon Capture and Storage Association (CCSA) is that $CO_2$ Capture and Geological storage will play a significant role in reducing emissions of $CO_2$ associated with the use of fossil fuel, enabling a future for the Country where it will meet its $CO_2$ emission reduction targets and develop a competitive business advantage for industry and the Nation.***


**Summary**

The application of Carbon capture and Storage (CCS) provides the UK with an additional $CO_2$ reduction technology, which can play a significant role in enabling the UK to meet its $CO_2$ targets whilst at the same time maintaining a broad portfolio of energy sources and enabling it to meet its future energy requirements. CCS technology is available now, and could be deployed on a scale to enable the UK Government to achieve its ambitious 2050 $CO_2$ emission reduction goal.

To make the most of the opportunity that CCS offers significantly to reduce $CO_2$ emissions of the UK, Government , Industry and other stakeholders need to work together to create the conditions that will enable the technology to be deployed. The limitation is not the technology or storage capacity; rather it is the lack of an investment environment that supports its deployment.


**Background**

Current policymaker thinking in Europe suggests a greenhouse gas reduction target of 60% by 2050[1] as the minimum to offset the worst effects of climate change.

For the EU, this equates to a reduction of about 3000 Mt $CO_{2e}$ of greenhouse gases p.a. and about 2300 Mt $CO_2$ p.a. by 2050.

Intermediate targets for 2020 of 15-30% are also envisaged.

By 2012 it is unlikely that the EU will have achieved more than an 8% reduction.

The UK Government has described an aim for the UK of a 60% reduction in $CO_2$ emissions by 2050[2] (i.e. a reduction of 352 Mt $CO_2$ p.a. from 1990 levels). An intermediate reduction of about 165 Mt $CO_2$ p.a. by 2020 is also envisaged[3] (equating to a reduction of a further 130 Mt $CO_2$ p.a. from 2003 levels).

UK $CO_2$ reductions are currently expected to reach about 15-18% ( 88-106 Mt $CO_2$ p.a. ) by 2010, less than the UK Government's 20% target ( 117 Mt $CO_2$ p.a.).

Against these reduction goals, the primary energy demand is expected to be higher in 2020 than in 2005.

In order to meet the aspiration of a low-carbon future avoiding the worst effects of Climate Change as well as acidification of the oceans, all countries will need to examine how to reduce $CO_2$ emissions whilst simultaneously maintaining economic growth.

In the case of the UK, this will mean that all sectors will play a role, but in particular the industry, transport and domestic sectors.

In the UK, about 28 % of the annual $CO_2$ emissions come from power stations (amounting to about 150 Mt $CO_2$ annually) and 26% from other major industries.

With about 30% of the existing power plant in the UK due for replacement over the next 10-15 years (this includes both nuclear and conventional plant), there is a clear opportunity for new fossil power plant with CCS to play a significant part in reducing UK $CO_2$ emissions.

**The Role of CCS**

The application of Carbon capture and Storage (CCS) provides the UK with an additional $CO_2$ reduction technology, which can play a significant role in enabling the UK to meet its $CO_2$ targets whilst at the same time maintaining a broad portfolio of energy sources and enabling it to meet its future energy requirements. CCS technology is available now, and could be deployed on a scale to enable the UK Government to achieve its ambitious 2050 $CO_2$ emission reduction goal.

The UK is well-placed for the geological storage of $CO_2$, with many tens of gigatonnes of $CO_2$ capacity, mainly below the continental shelf[4]. The deployment of CCS should not therefore be limited by the storage capacity available. There is also the additional benefit of Enhanced Oil Recovery in the Northern part of the North Sea using $CO_2$ from industry, which would then remain sequestered in the oil reservoirs at the end of operations

CCS is a technology most efficiently applied to large point sources of $CO_2$ such as power stations, oil refineries or other major industrial operations such as steel-making. There are several techniques, none of which have clear overall advantages. Some are suitable to particular fuels, others provide flexibility in de-carbonised fuel application or are most suitable for particular qualities of $CO_2$ streams, whilst others are more appropriate to smaller industrial waste gas streams. CCS offers the opportunity to reduce $CO_2$ emissions from point sources such as power plant by about 90% and, therefore, can play a significant role in enabling the UK to meet its $CO_2$ emissions goals.

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Between 2006 and 2010, the Government forecasts the closure of around 3000 MW of nuclear power station capacity[3]. For these and other reasons associated with maintaining security of supply, the construction of new power plant is likely to begin very soon. There is therefore an opportunity beginning now to build these early CCS technology-leading power plants.

The second impetus for CCS deployment occurs almost at the same time as the first. Under the Large Combustion Plant Directive, approximately 9000 MW of coal-fired plant, has opted for closure by the end of 2015. This coupled with the nuclear decommissioning programme means that by 2010 a large programme of power plant construction must be underway in the UK. Since the vast majority of the replacement plant will be fossil fuel based, the need for CCS capability becomes an imperative. It is also certain that many new plants/replacements will need to be committed before the regulatory framework for CCS is fully developed.

It is expected that, by 2020 over 20000 MW of new plant will need to be built in order to meet new demand plus the replacement of closed plant[3]. This is the equivalent of about 30% of existing capacity[5], and would generate about 140 TWh.

It is estimated that about an additional 40 TWh could be generated by new renewable energy sources[3] , leaving the remainder to be achieved by either new nuclear or fossil power plant.

100 TWh of coal or gas power plant output produces emissions of about 90 Mt and 40 Mt $CO_2$ respectively. Future coal plant may reduce emissions to about 78 Mt $CO_2$ per 100 TWh. Currently, fossil fuel power stations contribute about 150 Mt of $CO_2$ to UK emissions on an annual basis.

In the absence of a large scale nuclear new build programme, and with the penetration of renewables into the electricity market likely to be less than 20% by 2020[3], there is likely to be the need for at least 250 TWh of fossil power plant generation.

$CO_2$ emissions associated with 250 TWh fossil plant output would be in the range 100 to 195 Mt $CO_2$ ( an all gas – to an all coal portfolio ). If CCS technology were applied to all such fossil power plant , then the net $CO_2$ annual savings would be between about 90 and 170 Mt $CO_2$ .

There could also be significant reductions in $CO_2$ emissions in the other industrial sectors such as oil refineries, cement and steel-making if CCS technology were applied within these sectors. Potential reductions could be of the order of 45 Mt $CO_2$ p.a.

CCS could therefore play a significant role in achieving a 130 Mt $CO_2$ reduction by 2020, as required in order to remain on track to deliver the 60% reduction target by 2050. This is illustrated in figure 1.

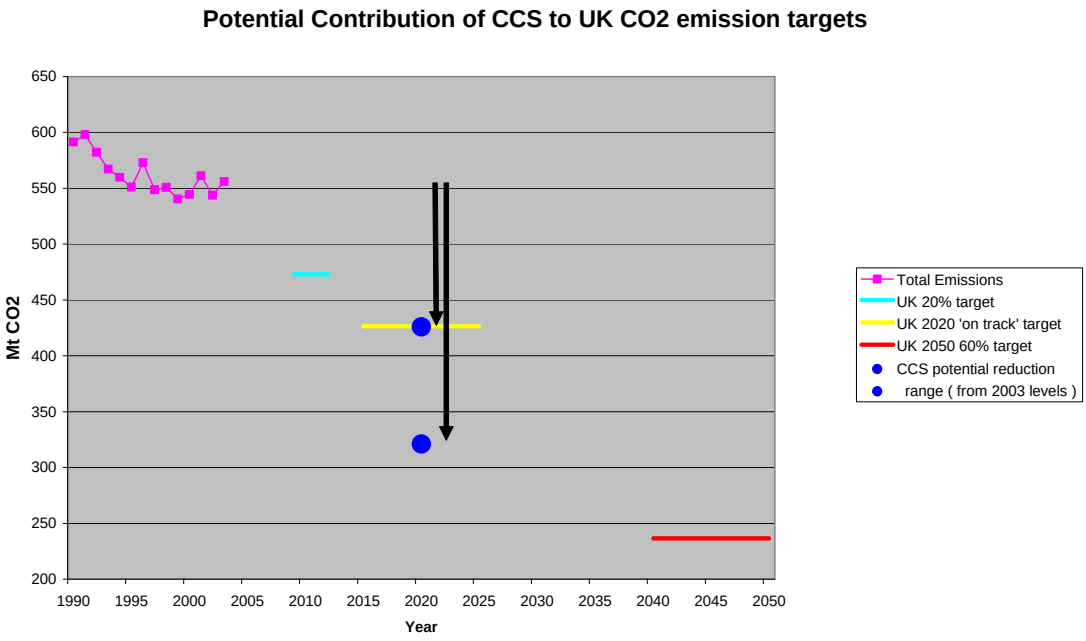


Figure 1. Illustration of potential CCS contribution to UK emission targets as applied to major industrial and power sources

**What is needed to make CCS happen?**

To make the most of the opportunity that CCS offers significantly to reduce $CO_2$ emissions of the UK, Government , Industry and other stakeholders need to work together to create the conditions that will enable the technology to be deployed. The limitation is not the technology or storage capacity, rather it is the lack of an investment environment that supports its deployment.

As with other new capital intensive technologies to be deployed in a market environment, the 'first-of-a-kind' CCS plants will improve understanding of issues associated with full-scale plant. These include, improving energy and $CO_2$ capture efficiency, integration with primary commodity production ( e.g. electricity, oil refining, steel etc.), and cost reduction opportunities. Since the early CCS plants will be operating in a commercial environment, they will need a level of financial support to cover the additional cost. However CCS, is already comparable in cost to other low or non- carbon sources of power (such as wind and Nuclear) and the costs of this technology are likely to fall in the future as we see the benefits of advanced technology R&D and deployment experience bear fruit.

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**The Way Forward**

The CCSA has brought together a cross section of industry and other key stakeholders, however Government must also play a key role to help promote and enable the successful deployment of this technology.

To this end, the CCSA would like to see the Government work with us and do following:

1. **Implement an incentive scheme or schemes, to allow quick and commercially viable deployment of CCS either combined with EOR or independently.**

2. **Modify legislation in such a way that large quantities of $CO_2$ can be stored for indefinite periods in geological formations under land or the sea bed in depleted oil and gas fields; saline aquifers; or in deep, unminable coal beds.**

[1] Developed Nations contribution to stabilisation of $CO_2$ concentrations at 550 ppm by 2050, EU Enivronment Council March 2005.

[2] Energy White Paper 2003

[3] Our Energy Challenge: Energy Review Consultation document Jan 2005

[4] Capture and Geological Storage of CO2 - A status report on the technology, British Geological Survey for DTI

[5] Digest of UK Energy Statistics (DUKES 2005)