

UK to build world's first CCS plant

The first step towards making the UK a world leader in carbon capture and storage (CCS) technology was announced by Chancellor Gordon Brown in his 2007 Budget 2007 in March. The CCS Association welcomed the announcement that the Government: "will launch a competition to develop the UK's first full-scale demonstration of carbon capture and storage," to begin operation in the next decade.

CCSA Chief Executive Dr Jeff Chapman commented: "CCS is fast becoming a significant plank of the UK's energy scenario for the future and the Government is showing real commitment with early development of a regulatory framework to encourage investment in this important technology. We are pleased to see that the Chancellor has recognised the urgency expressed in the Stern Review and around the world, and is backing words with actions."

"Government calculations have confirmed that, by 2020, 20 GW of new power generation plant will be needed to meet UK energy needs. Meanwhile, for the EU to meet its now binding target of a 20% reduction in greenhouse gases by 2020, it is vital that the first commercial-scale EU CCS demonstration plant is built as soon as possible, paving the way for the development of a CCS industry that will make an impact in the wider international arena. It is encouraging that the Government has grasped a leadership role with the announcement that the UK will develop this first demonstration project."

The CCS projects currently proposed in the UK (see page 2) have the potential to demonstrate the range of attractive technologies and could make a substantial contribution to the EU's plan to bring on stream 12 demonstration projects by 2015. With the convenient location of North Sea storage capacity, the UK has a unique opportunity to demonstrate the benefits of CCS in helping to mitigate climate change.

Jeff Chapman concludes: "We look forward to working with the Government on the development of a competition to support this first project and eagerly await further support to encourage further commercial CCS projects."

Secretary of State for Trade and Industry, Alistair Darling added: "Gas and coal are important to the energy mix globally and in the UK. The Stern report was clear that, even with strong action on renewables and other low-carbon technologies, fossil fuels may still make up to half of the world's energy supply by 2050. CCS has the potential to reduce carbon dioxide emissions from fossil fuel power stations by up to 90%, and contribute 20% of global carbon dioxide mitigation by 2050."

"Rapid deployment of CCS technology in growth economies such as China and India will be vital. This competition gives innovative UK industries the opportunity to become the leading exporters of CCS technology for the low carbon age," added Darling.

More detail about the competition will be announced in the forthcoming Energy White Paper and the result will follow next year.

Extracts from the Budget 2007 report Chapter 7: Protecting the Environment

Carbon capture and storage

Carbon capture and storage (CCS) could reduce the carbon dioxide emissions from fossil fuel power stations by as much as 90%. The Government made clear in the Energy Review that the next logical step for CCS would be building a full-scale demonstration plant, subject to it being cost-effective. Since the 2006 Pre-Budget Report, the DTI has appointed consulting engineers to look robustly at the costs of a CCS plant based in the UK, and help the Government ascertain whether supporting one through a challenge fund or other mechanism would provide value for money.

The Government announces today that it will launch a competition to develop the UK's first full-scale carbon capture and storage demonstration, the result to be announced next year. When operational early in the next decade, this will make the UK a world leader in this globally important new technology.

▶ www.hm-treasury.gov.uk/budget/budget_07/bud_bud07_index.cfm

UK CCS Regulation Task Force

The UK CCS Regulation Task Force exists to clarify existing regulations for CCS; identify gaps and any need for new regulations; and to develop new regulation as required. Membership of the Task Force is made-up of representatives from the DTI, Defra, the Treasury, the Environment Agency, the Crown Estate and the HSE. The CCSA is providing valued input to the Task Force through its Regulatory Working Group led by Malcolm Stephenson from Shell.

The Task Force is currently looking at regulation in four areas:

- licensing of carbon dioxide storage sites and activities offshore;
- decommissioning and abandonment of storage facilities;
- long-term liabilities for abandoned carbon dioxide storage sites; and
- licensing and regulation of onshore facilities, including carbon dioxide capture.

The Task Force has held two stakeholder consultation workshops so far, and is expected to issue a formal consultation document on draft regulation in early summer.

Without CCS, the world is going to get much hotter, much quicker.

David Miliband MP, Secretary of State for Environment, Food and Rural Affairs

Welcome

Jeff Chapman, Chief Executive, Carbon Capture & Storage Association



Welcome to this first edition of *CCSA News*. The world of carbon capture and storage (CCS) is moving rapidly now and there is much to report. The Association makes steady progress but we cannot rest until that progress results in major projects being built and therefore reducing carbon dioxide emissions for the UK, in Europe and for the world.

It is just a year since the CCSA was launched with eleven founder members by the then UK Energy Minister, Malcolm Wicks. Membership now has risen to 44 organisations and continues to expand. The list reads like a 'who's who' of the energy sector (see page 6). The CCSA has become a force to be reckoned with and its influence is felt at home and abroad.

The only thing holding-up the development of CCS in the UK and elsewhere is the lack of clear, robust and enduring policy relating to incentives and a positive regulatory framework for CCS. Without these, commercial projects are not viable.

It is not surprising that much of this newsletter is dedicated to policy developments. We are lucky in the UK that the Government has taken a leading role in the development of policy and that officials of the DTI, Defra and the Treasury have taken on the task so enthusiastically.

In its turn, industry has responded by embarking on the development of a range of at least eight power projects designed to include CCS. The projects will be badly needed to 'keep the lights' on in 15–20 years time, when many of our existing coal and nuclear plants will have been decommissioned. If construction of these plants can get under way in the next couple of years, the UK will be well on course to fill the generation gap, curb its emissions and be well-placed to engage in a worldwide business in the next decades measured in trillions of pounds.

Proposed UK CCS projects

Eight CCS projects are currently planned for the UK, with a total generating capacity of nearly 7 GWe. Together, the projects would reduce carbon dioxide emissions by about 30 million tonnes per year.

Pre-combustion capture: gas

- 375 MWe project at Peterhead by Scottish & Southern Energy and BP

Pre-combustion capture: solid fuel

- 800 MWe IGCC project at Teesside by Coastal Energy
- 450 MWe project at Killinglome by E.ON UK
- 900 MWe project at Hatfield Colliery by PowerFuel
- Gasifier at Immingham to power 1200 MWe CHP scheme and process hydrogen, by ConocoPhillips

Post-combustion capture or oxy-fuel

- 500 MWe supercritical, capture-ready retrofit at Ferrybridge by Scottish & Southern Energy
- 1600 MWe supercritical/oxyfuel Project at Tilbury by RWE npower
- 1600 MWe supercritical plant with biomass firing at Kingsnorth by E.ON UK

Developing Britain's CCS potential

Ian Pearson MP, Minister of State for Climate Change & Environment

Carbon capture and storage (CCS) has come to public prominence recently and with good reason. Many people are realising that if we are to tackle climate change effectively, it will take all the effort we can marshal. With the fast increasing use of fossil fuels, which is fuelling growth in the rapidly industrialising countries in particular, there is increased recognition that we need a broad portfolio of mitigation options to deal with the global challenge. CCS must take its place within that.



I am convinced that CCS is an important technology needed in both the developed and developing world. I think it is vital that we bring on research and development as well as setting up more demonstrations to show how this technology can work

in practice. We need to see this happening in the UK, as the Government has already recognised, and more widely in the EU, following recent agreement by EU Heads of Government.

The UK can help show the rest of the world how important and useful this technology can be by developing its own CCS potential, particularly the capacity for storage found in the North Sea. We also want to provide incentives for its use internationally. It is for this reason that the UK is working with other key countries, for instance with China on 'near zero emissions coal'.

CCS is a good example of how industry can supply technological know-how to help provide climate change solutions.



Towards 12 CCS projects by 2015 – European Council backs proposals

The leaders of the EU's 27 member states have adopted a comprehensive package of measures to establish a new energy policy for Europe to both combat climate change and boost the EU's energy security and competitiveness. The undoubted highlights were a binding unilateral EU commitment to cut greenhouse gas emissions by at least 20% by 2020 compared with 1990 levels, and Council support for the establishment of a mechanism to stimulate the construction of up to 12 demonstration CCS projects by 2015.

The agreement, made at a European Council meeting held in Brussels in March, also included challenging targets on the future use of renewables and biofuels in Europe and a call for an extension of the EU Emissions Trading Scheme to cover land-use and forestry.

The Council's action plan for 2007–09 makes explicit recognition of the: "huge possible global benefits of a sustainable use of fossil fuels," and "underlines the importance of substantial improvements in generation efficiency and clean fossil technologies." It therefore: "urges Member States and the Commission to work towards strengthening R&D and developing the

necessary technical, economic and regulatory framework to bring environmentally safe carbon capture and sequestration (CCS) to deployment with new fossil-fuel power plants, if possible by 2020."

The Council adopted nearly all of the proposals initially tabled by the European Commission, including radical EC proposals on CCS. These propose the programme of 12 new demonstration CCS projects to be operational by 2015, as well as a recommendation that all power plants built after 2020 must include carbon capture and storage technology. Details are contained in a separate 'communication' from the EC – see *box opposite*.

► http://ec.europa.eu/environment/climat/ccs/work_en.htm

Carbon capture and storage has massive potential to allow us to meet our energy needs at the same time as cutting carbon emissions. It opens up huge possibility, not just for Britain but also but for the world.

Alistair Darling MP, Secretary of State for Trade and Industry

Aiming towards a low carbon dioxide fossil fuel future

Climate protection involves making the most efficient use of our available energy sources, says the European Commission. The potential to increase the efficiency of converting coal into electricity must therefore be exploited in Europe and worldwide. Furthermore, the technologies for the capture and permanent storage of carbon dioxide produced by power plants must be developed further and used more widely. The EC has adopted a Communication on how to generate power from fossil fuels in a sustainable manner with a focus on sustainable coal technologies – these will enable coal to maintain its important contribution to secure and competitive energy supplies for Europe.

Coal and gas account for over 50% of the EU's electricity supply and will remain an important part of our energy mix. If the EU is to achieve its long term climate change objectives, much cleaner coal technologies and a significant reduction of carbon dioxide emission will be necessary. Furthermore, developing clean coal and carbon capture and storage technologies is crucial at the international level: it is expected that twice as much electricity as today will be produced world-wide from coal by 2030. This will in turn

bring new opportunities for European export as well, says the EC.

In order to make sustainable fossil fuels a reality after 2020, the EU must establish a favourable regulatory framework for the development of these novel technologies, invest more, and more efficiently, into research, as well as take international action. The EU Emission Trading Scheme will also need to incorporate capture and storage in the future.

The Commission will in 2007 start work to:

- design a mechanism to stimulate the construction and operation by 2015 of up to 12 large-scale demonstrations of sustainable fossil fuel technologies in commercial power generation in the EU;
- and provide a clear perspective when coal- and gas-fired power plants will need to install carbon dioxide capture and storage. Today, the Commission believes that, by 2020, all new coal-fired plants should include carbon dioxide capture and storage technologies and existing plants should then progressively follow the same approach.

Carbon dioxide can now be stored under the sea

The storage of carbon dioxide in rock formations under the world's oceans became legal in February, following international agreement to amend the London Protocol.

The London and OSPAR conventions were established some time ago to control dumping at sea; London covers all the world's oceans and OSPAR covers the North East Atlantic shelf. In 1972 when 80 countries signed up to London no-one had even thought about carbon storage so it was understandable that storage of carbon dioxide under the sea bed was ignored. In mid-2003, Defra, working with Norwegian colleagues, began the long haul to get changes agreed to both conventions.

After three and a half years of scientific reports, meetings of experts, jurists, linguists and ministers, an amendment to the London Protocol was finally adopted on 2 November 2006. The amendment allows: "carbon dioxide streams from carbon dioxide capture processes for sequestration only if it is into a sub-seabed formation, it consists overwhelmingly of carbon dioxide and no wastes or other matter are added for the purpose of disposal." The agreement came into effect from 10 February 2007.

For those countries interested in storing carbon dioxide under the North Sea, there is more work to be done to get a similar amendment to the OSPAR Convention. A draft amendment will be tabled by Norway, UK and Netherlands to a meeting of the 16 Parties to OSPAR in June.

► www.imo.org/Newsroom/mainframe.asp?topic_id=1472&doc_id=7772

Emissions trading and CCS

Once established, CCS will take its place as a main-stream carbon-reducing technology and thus be able to be a participant technology in both emissions trading schemes and the Kyoto Clean Development Mechanism (CDM).

However, realistically, CCS is unlikely be a meaningful part of the EU Emissions Trading Scheme until its third phase, starting in 2013. From that time, it is intended that CCS will become an important part of the EU ETS.

Currently, ETS monitoring rules do not take account of sequestered carbon dioxide, yet the ETS Directive does allow new activities to be included. The UK Government is among several parties pressing the European Commission to opt-in CCS installations under Article 24 of the original Directive – as a new activity in Phase 2, while pursuing the development of rules to include CCS in Phase 3 and beyond.

► www.defra.gov.uk/environment/climatechange/trading/eu/index.htm

Project update

Tees Valley IGCC station would store carbon dioxide under the North Sea

Clean coal project developer Progressive Energy has concluded an agreement with Centrica to invest in the potential development of an advanced clean coal project to be located in the Tees Valley. If both parties agree to pursue this option further to additional technical work, the project will utilise an integrated gasification combined cycle power station of around 800 MWe, incorporating carbon capture and storage. It is intended to pipe the power station's carbon dioxide emissions to oil fields in the North Sea, where it will be used to enhance oil recovery from mature fields, and permanently stored.

The power station would be owned by a new company, Coastal Energy, and the carbon dioxide pipeline assets by a second new company, COOTS Ltd. Centrica will fund the ongoing development costs of Coastal Energy and COOTS, and will have the option to buy Progressive Energy shares in Coastal. Progressive Energy will retain a shareholding in COOTS.

As well as providing approximately 6 TWh of low carbon electricity per year, the project has the potential to provide the basis for a wider infrastructure – enabling the disposal of carbon dioxide from other projects that can capture the greenhouse gas. It also opens the door to securing otherwise unrecoverable oil from mature fields in the North Sea, says Progressive.

Project update

Hatfield IGCC aims to capture carbon from 2011

Owned by PowerFuel Plc, the Hatfield Power Project aims to be the first commercial coal-fired power station in the world with carbon capture. It is to be located at the Hatfield colliery in South Yorkshire, with access to up to 100 million tonnes of British coal, and within a cluster of local power stations. Planning permission and government consent (the only Section 36 consent for a coal-fired power station) have been obtained and £1 billion in project financing is anticipated, says PowerFuel.

The target is for the project to be generating power from 2012.

The core project will be a 900 MWe integrated gasification combined cycle (IGCC) power station, incorporating carbon capture from the outset and with the capability to produce both hydrogen for transport use and syngas for possible pipeline export to other local stations for power generation.

It is expected that captured carbon could be piped out to the North Sea for enhanced oil recovery and sequestration in depleted oil and gas reservoirs.

The project is one of several being planned in the vicinity at Humberside; several other existing point carbon sources are in the area, making this region an outstanding contender for investment in carbon dioxide infrastructure, adds PowerFuel.

Project update

Supercritical units in Kent will be 'capture-ready'

Britain may finally be on course to see the development of full-scale 'supercritical' coal power station technology, together with a carbon dioxide 'capture ready' element, in Kent. E.ON UK has entered a consulting stage over its plans to build two new 800 MWe supercritical units at its Kingsnorth coal-fired power station. The application is for supercritical coal-fired units which, if built, would reduce carbon emissions by almost two million tonnes a year compared to the existing units. The two 800 MWe units would be built next to the existing station and would be 'carbon capture ready' says E.ON.

The new units, which would operate at an efficiency of 45% and above compared to the existing units' 36%, would be built next to the existing four 485 MWe coal-fired units, which will cease operation and be demolished once the new units are fully operational and proven.

E.ON UK says it is considering making the new units capable of burning biomass with coal. They could eventually be fitted with amine 'scrubbers' or other carbon capture technology to remove the carbon dioxide before emission. The new units would only start generating commercially once the existing units had ceased operation, which must be by the end of 2015 under the strictures of the EU's Large Combustion Plant Directive, says E.ON. Meanwhile, E.ON has started trial of burning coal in pure oxygen –

called 'oxyfuel' – at its Power Technology facility next to the Ratcliffe-on-Soar coal-fired power station. Once the effects of such a combustion method are further understood, the next step could be to 'capture' the pure carbon dioxide that results from the process and to store it underground.

Artist's impression of the new Kingsnorth plant



Project update

Clean coal power station in Essex would be CCS 'capture ready'

RWE npower has set out plans for a 1600 MW state-of-the-art cleaner coal power station to replace its existing coal-fired station in Tilbury, Essex. The new power station, which would cost over £1 billion to build and would be operational by 2013, will be designed to accommodate carbon capture and storage technology.

In an environmental scoping document submitted to the DTI, RWE npower detailed proposals which would see the existing station replaced with two 800 MW high efficiency supercritical coal-fired units. The scoping study is a preliminary step preceding an application, under Section 36 of the Electricity Act, for consent to build the station.

The new station would have the capacity to reduce carbon emissions by 22% per unit of electricity generated, which would result in a carbon dioxide reduction of almost two million tonnes a year compared to existing coal fired plant in the UK, says the company. The new station will also be developed to include facilities for burning carbon neutral biomass.

Andy Duff, Chief Executive of RWE npower said: "A supercritical coal plant on its own would result in a significant net reduction in carbon dioxide levels, but we have also chosen to make the power station ready for carbon capture and storage technology. At this time, there are still many financial, legal, regulatory and technical hurdles to clear on carbon dioxide transportation and storage technology. However, it is too important to ignore and we are committed to further research and development and are assessing our next steps."

Expanded Immingham CHP plant could also incorporate CCS

ConocoPhillips has announced the approval of an investment of approximately £210 million to expand the capacity at its Immingham CHP plant from 730 MWe to 1,180 MWe. This expansion would make Immingham CHP one of the world's largest and most efficient power stations and an additional source of low carbon heat and power for the UK. Commercial operation of the expansion is currently expected to start in the summer of 2009.

The plant provides steam heat and electrical power to ConocoPhillips' Humber refinery and steam heat to Total's Lindsey oil refinery, both adjacent to the plant in North Lincolnshire. By combining the production of heat and power, Immingham CHP uses 20% less fuel and produces 25% less carbon than the alternative of producing heat and power separately, says ConocoPhillips.

If current studies demonstrate economic feasibility, the enlarged Immingham CHP could be modified to utilise gasification technology to operate as a 'clean coal' facility with carbon dioxide stored or used for enhanced oil recovery.

The Immingham CHP commenced commercial operation late 2004, and is already one of the largest, cleanest and most efficient of its type in Europe. The expanded plant, together with ConocoPhillips' Humber refinery, is strategically placed to realise the vision of an ultra-low-carbon integrated energy hub able to supply heat and power to a wide range of local industrial customers, says the company.



Part of the original CHP plant installed in 2004

Watch this space

The world of energy policy-making never stands still. Check the CCSA website for updates on these issues as they emerge: www.ccsassociation.org.uk

Policy measure	Expected ...
Britain's Energy White Paper	May
OSPAR meeting to discuss an amendment to the convention to allow storage of CCS under the North Sea	June
UK consultation on CCS regulation	Early summer
EU consultation on CCS	Late summer

Late news ...

'Capture ready' plant planned for Blyth

RWE npower is to investigate the feasibility of a new, state-of-the-art 2400 MW, cleaner coal power station on the site of the former Blyth Power Station on the north-east coast. In an environmental 'scoping document' submitted to the DTI, the company outlines proposals for a new power station consisting of three 800 MW, high-efficiency supercritical coal-fired units. The proposed station would be extremely efficient, reducing carbon dioxide emissions by over 22% per unit of electricity generated compared to an equivalent-sized existing UK coal-fired power station, says RWE.

It would also be designed to be 'carbon capture ready' so that, once CCS technology is proven, the carbon dioxide produced would be transported to the North Sea and stored in geological formations. The new station would also be developed to include facilities for burning up to 10% biomass to further reduce emissions.

Once in every generation, an industrial opportunity comes about whose scale and potential are so mind blowing that it must be grabbed and realised.

Alex Salmond MP on CCS

Even with very strong expansion of the use of renewable energy and other low carbon energy sources, fossil fuels could still make up over half of global energy supply in 2050 ... extensive carbon capture and storage will be necessary to allow the continued use of fossil fuels without damage to the atmosphere ... Carbon capture and storage is essential to maintain the role of coal in providing secure and reliable energy for many economies.

Stern Review, October 2006

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The CCSA is a business association formed in the UK represent the interests of its members in the development of business in geo-CCS wherever opportunities may exist.
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CCSA members

- Air Products
- Alstom Power
- AMEC
- BG Group
- BGS
- BOC
- BP
- British Cement Association
- Chevron
- Climate Change Capital
- Coal Authority
- ConocoPhillips
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