

**Technology Strategy Board**

Driving Innovation



# Carbon Abatement Technologies

**JUNE 2009 COMPETITION FOR FUNDING**



**ENERGY GENERATION AND SUPPLY APPLICATION AREA**



The Technology Strategy Board, in partnership with The Northern Way\* and the Department of Energy and Climate Change's (DECC's) Environmental Transformation Fund\*\*, have allocated up to £15M to invest in innovative collaborative research, development, component and pilot scale demonstration, in the area of carbon abatement technologies. Development of these technologies will contribute significantly to meeting UK and EU climate change targets whilst providing significant market opportunities for a strong UK capability base.

\* The Northern Way is a unique initiative, bringing together the cities and regions of the North of England to work together to improve the sustainable economic development of the North towards the level of more prosperous regions. Formed as a partnership between the three northern Regional Development Agencies (Yorkshire Forward, Northwest Regional Development Agency and One NorthEast), they also work with local authorities, universities, the private sector and other partners to secure a strong coalition in support of this goal.

\*\* The Department of Energy and Climate Change (DECC) brings together much of the Climate Change Group, previously housed within the Department for Environment, Food and Rural Affairs (Defra), with the Energy Group from the Department for Business, Enterprise and Regulatory Reform (BERR). The Environmental Transformation Fund is a new initiative to bring forward the development of new low carbon energy and energy efficiency technologies in the UK. The fund formally began operation on 1 April 2008, and is jointly administered by Defra and BERR.

# Carbon Abatement Technologies

## JUNE 2009 COMPETITION FOR FUNDING

### Summary

This competition is prioritising technologies that tackle CO<sub>2</sub> emissions from large single point sources, primarily fossil-fuel power plant and other large process industries such as those related to petrochemicals, cement, steel and other metals production.

It is focusing on the development of technologies which will offer significant improvements:

- Efficiency of conversion processes to reduce the amount of fuel consumed and associated CO<sub>2</sub> emissions.
- Technologies which significantly reduce emissions from process industries (such as petrochemicals, cement and metals production).
- Fuel switching to lower carbon alternatives such as co-firing with biomass or waste.
- Carbon capture technologies, CO<sub>2</sub> transport, storage and use.
- Development of underpinning technologies that support carbon abatement technologies such as those relating to materials, non-destructive inspection, instrumentation, modelling and condition monitoring.

The scope of this competition includes collaborative proposals which focus primarily on applied R&D, and pilot scale and component demonstration. It is also considering feasibility studies which will lead to faster or novel technology implementation in the future.

### Background and Challenges

Fossil fuels currently provide over 70% of the UK's electricity generating capacity and so underpin most aspects of modern life and the security of electricity supply to the UK. Whilst the introduction of renewable energy technologies and potential construction of new nuclear plant will reduce this dependence over time, most projections show that fossil fuels will continue to dominate both UK and global energy supply for at least another 40 years.

In addition to power plant, large process industries such as petrochemicals, cement and metals production are also significant contributors to CO<sub>2</sub> emissions, which can be addressed through the application of related innovative technologies. Against this dependence on large single point emitters of CO<sub>2</sub> to support the UK infrastructure and economy, there are political and regulatory pressures to tackle climate change, with the UK Government targeting a reduction in greenhouse gas emissions of 80% by 2050 and supporting actions to limit the global temperature rise to 2°C.

Given these scenarios, it is clear that the development and demonstration of cost effective technologies which reduce CO<sub>2</sub> emissions are essential if fossil-fuel power plant and large process industries are to remain viable in the future as legislation becomes tighter.

Drawing on the views of organisations such as the Advisory Committee on Carbon Abatement Technologies<sup>1</sup>, the Advanced Power Generation Technology Forum<sup>2</sup> and their own studies, the Technology Strategy Board, DECC and The Northern Way have identified a number of key technology areas for investment which will enhance UK businesses' position to develop and commercialise carbon abatement technologies both within the UK and in the global market, where significant opportunities exist both for the construction of new plant and retrofitting of existing plant.

### Scope

The competition will focus on the applied research, development, component and pilot scale demonstration of carbon abatement technologies that will improve efficiency, reduce cost and accelerate their deployment, with particular emphasis on the supply chain development and the planned route to commercialisation of results.

1. A Strategy for Developing Carbon Abatement Technologies for Fossil Fuel Use, June 2005 (currently under revision) URN 05/844
2. Advanced Power Generation Technology Forum [www.apgtf-uk.com](http://www.apgtf-uk.com)

All proposals must explain how the work will help in positioning the UK in the global market and against other global innovative leaders in this field. In particular, the proposals should state how they will enable the UK to contribute to the EU targets relating to both CO<sub>2</sub> emissions and deployment targets of carbon capture and storage plants.

The technology areas within the scope are highlighted in the next section. The outputs of the programme should produce the new technologies and skills for the future. Apart from supporting established industries, the programme will also provide the foundation and opportunities for new market entrants, spin-off companies and produce spill-over benefits to and from other sectors.

### Carbon abatement technologies

Carbon abatement technologies are a group of innovative technologies that enable these large plants to operate with substantially reduced CO<sub>2</sub> emissions. This means that they can be part of the solution to climate change, whilst still making a major contribution to the security of electricity supply and the UK economy. For example, carbon abatement technologies have the potential to reduce carbon emissions from fossil-fuel power stations by up to 90% and have significant export potential.

The competition will support innovative solutions for carbon abatement technologies primarily for fossil-fuel power plant but it will consider technologies that are also applicable to other CO<sub>2</sub> intensive process industries. The high level challenges identified are to provide **cost effective, energy efficient** solutions to CO<sub>2</sub> reductions with **high reliability** and **durability**.

Proposals will address these challenges by focussing on one or more of the following:

- Improving the efficiency of existing/developing technologies to support the extra demands placed upon equipment operating in increasingly aggressive environments. This includes developments in boiler technologies for efficient coal combustion, and advanced steam and gas turbine technologies to accommodate higher temperatures and pressures.

- Technologies which support fuel switching to lower carbon alternatives such as co-firing of fossil fuel with biomass and/or waste.
- Advanced gasification and associated technologies.
- Improved technologies for reducing CO<sub>2</sub> emissions from large single point sources of CO<sub>2</sub> in processing plant (such as petrochemicals, cement and metals).
- Further developing existing CO<sub>2</sub> capture technologies including pre- and post-combustion and oxy-fuel firing, and associated technologies to improve their efficiency and reduce capital and running costs. These will include technologies for:
  - natural gas processing with carbon capture to produce hydrogen
  - carbon capture for pulverised coal technology, including technologies such as oxy-fuel firing and amine scrubbing
  - gasification and syngas production
  - membrane technologies for gas separation.
- Developing CO<sub>2</sub> compression and handling technologies for subsequent transport and storage.
- Developing technologies associated with the safe transport and storage of CO<sub>2</sub>.
- Technologies for the alternative uses of CO<sub>2</sub> (such as an industrial feedstock) which are economic, energy efficient and environmentally friendly.

## Underpinning technologies

We will consider investment for underpinning technologies which will support the overall objectives of the programme and have a clear integration plan for end-use and commercialisation. Ideally, these should form part of a larger integrated project.

Underpinning technologies include:

- advanced materials which are required to operate in more arduous environments for both sub-components and major plant components as outlined in the Technology Strategy Board's Advanced Materials Strategy<sup>3</sup> and Materials UK's Strategic Research Agenda<sup>4</sup>
- non-destructive inspection technologies for in-situ examination in aggressive environments
- instrumentation and condition monitoring (including CO<sub>2</sub> monitoring)
- lifetime prediction and modelling of sub-components, components and integrated plant.

## Co-ordination with other Funding Bodies

Within the UK, in order to take advantage of the significant business opportunities, policy targets and environmental benefits that carbon abatement technologies present, we need a co-ordinated and integrated delivery programme spanning the full innovation chain.

As well as this competition being jointly sponsored with DECC and The Northern Way, the Technology Strategy Board is working closely with other funding bodies such as the Research Councils, Carbon Trust and Energy Technologies Institute to ensure that a portfolio of projects spanning the innovation chain is developed which will tackle both short- and long-term challenges relating to climate change and security of supply, whilst developing significant opportunities for wealth creation in the UK. This competition complements the recent Research Council competitions on carbon capture and storage which are focussed on fundamental R&D.

3. Technology Strategy Board: Advanced Materials Strategy 2008 [http://www.innovateuk.org/\\_assets/pdf/corporate-publications/advanced%20materials%20exec%20summary.pdf](http://www.innovateuk.org/_assets/pdf/corporate-publications/advanced%20materials%20exec%20summary.pdf)

4. Materials UK Energy Review- Fossil-fuelled Power Generation, December 2007 [http://matuk.co.uk/docs/2\\_Fossil%20Energy%20FINAL.pdf](http://matuk.co.uk/docs/2_Fossil%20Energy%20FINAL.pdf)

## Funding Allocation and Project Details

In this competition an indicative amount of up to £15M of funding is allocated to innovative collaborative research, development, component and pilot scale demonstration projects that address one or more of the areas indicated above and involve science-to-business and business-to-business interactions involving a minimum of two partners (one industrial).

We are particularly looking for projects that will give the UK a market lead and develop its supply chain in a timely fashion and so welcome projects that span both applied R&D and component or small-scale pilot demonstrations. This programme will encourage projects that can build on existing UK world class knowledge such as that which has arisen from previous public or privately funded projects, particularly those where the technology is ready to move from the lower levels of readiness, towards demonstration.

There will be two levels of application:

1. Feasibility studies – as part of the total programme, indicative funding of up to £1M will be allocated to short-term (6-12 month) feasibility studies (attracting up to 75% public sector funding), with a total project size of up to £150k. These studies must be industry-led and are specifically targeted at SMEs that:
  - have technologies which they believe can provide innovation and added value to carbon abatement technologies
  - are considering entry into this market
  - require small-scale technical feasibility studies to support their business case.

Proposals requesting funding of feasibility studies will go through a fast-track, single stage process described in the Guidance for Applicants.

2. The balance of the programme will focus on industry-led collaborative projects which will normally last 2 to 3 years, require public sector funding investment of typically £250k to £2.5M, spanning both applied R&D (attracting up to 50%



public funding) and component or small-scale pilot demonstrations (attracting up to 25% public funding), or a combination of both. These projects should generally aim to implement business change 3 to 5 years from the end of the project.

Definitions of the above categories of research can be found in the Guidance for Applicants.

Details relating to the regional aspects of this programme and eligibility for support from The Northern Way investment can also be found in the Guidance for Applicants and will be available at the briefing days.

## International Collaboration

In view of the importance of these technologies and the global impact of CO<sub>2</sub>, combined with the significant number of multinational organisations looking to address these challenges, proposals will be considered which include aspects of international collaboration with non-UK based organisations (where they are self-funded), providing there is a minimum of two UK partners (one industrial) and clear quantified benefits to the UK.

## Application Process

The application process for this competition is in line with Technology Strategy Board policy which seeks to give applicants the opportunity to make an initial optional Expression of Interest (EOI) prior to their compulsory application. The optional EOI will be looked at by officials and a response given to applicants within 3 working days. Applicants may take advantage of this up to one week prior to the compulsory EOI deadline. The key dates for this competition are 15th June when the competition opens and 23rd July when the compulsory EOI must be submitted.

The main collaborative R&D competition is run in two stages:

1. the compulsory EOI stage
2. the full stage – for applicants recommended by the independent panel.

As this competition runs across the summer, the full stage will not begin until 1st September 2009. The application process for feasibility studies is single stage opening on 15th June and those applicants who are successful will be informed by 21st August.

The Guidance for Applicants explains the process in detail. In short, applicants need to submit their compulsory EOI (for both feasibility studies and collaborative R&D applications) by 23rd July 2009 and this will be reviewed and feedback given on 21st August 2009. Between 15th June and 15th July 2009 (all deadlines are at midday) applicants will be able to submit their optional EOIs and receive initial comment on an optional and no commitment basis. Following the

independent panel review, the Technology Strategy Board will then invite applicants whose proposal fits firmly within the scope and the criteria of the competition, to the full stage. For these applicants, in the week beginning 24th August 2009, there will be the opportunity to discuss the feedback with Technology Strategy Board officials by telephone. Details can found at [www.innovateuk.org](http://www.innovateuk.org)

There will be a briefing day specifically for this competition in Manchester on 24th June. Whilst this briefing is optional, potential applicants are strongly advised to attend if possible. Applicants invited to submit a full proposal will need to send one representative of their consortium to the compulsory briefing on 9th September in London. They will also need to register their intention to apply by 8th October 2009 and submit their full application by 15th October 2009. Applicants will be informed of the outcome of their applications by 16th November 2009.

## Key Dates

### Feasibility study applications

Competition opens	<b>15th June</b>
Compulsory Expressions of Interest deadline	<b>23rd July</b>
Successful applicants informed by	<b>21st August</b>

### Collaborative R&D applications

Competition opens	<b>15th June</b>
Briefing day (optional)	<b>24th June Manchester</b>
Compulsory Expressions of Interest deadline	<b>23rd July</b>
Feedback on Expressions of Interest provided by	<b>21st August</b>
Feedback discussion in week beginning	<b>24th August</b>
Full stage (for invited applications) opens	<b>1st September</b>
Applicants briefing (compulsory)	<b>9th September London</b>
Registration of intent to submit (compulsory)	<b>8th October</b>
Deadline for receipt of full applications	<b>15th October</b>
Decision and feedback to applicants	<b>16th November</b>



## More Information

For more information about this and other competitions and details of how to register and apply, please see Competitions at [www.innovateuk.org](http://www.innovateuk.org). The Guidance for Applicants is also available online in the Competitions area.

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01355 272155

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*The Technology Strategy Board is a business-led executive non-departmental public body, established by the government. Its role is to promote and support research into, and development and exploitation of, technology and innovation for the benefit of UK business, in order to increase economic growth and improve quality of life.*

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